Assessment of Bioaccumulation Risks in San Diego Bay: Study Overview

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Workshop Agenda

- **Study overview – Steve Bay**
- **Results summary – Steve Bay**
- **Wildlife risk – Katie Zeeman**
- **Human health risk – Steve Bay**
- **Next steps and perspectives**

Many Partners

- SCCWRP
- USFWS
- San Diego Water Board / State Water Board
- San Diego State University
- San Diego Regional Harbor Monitoring Program (RHMP)
  - Amec Foster Wheeler
  - Port of San Diego
  - City of San Diego
- Bight ‘13 Regional Monitoring Program

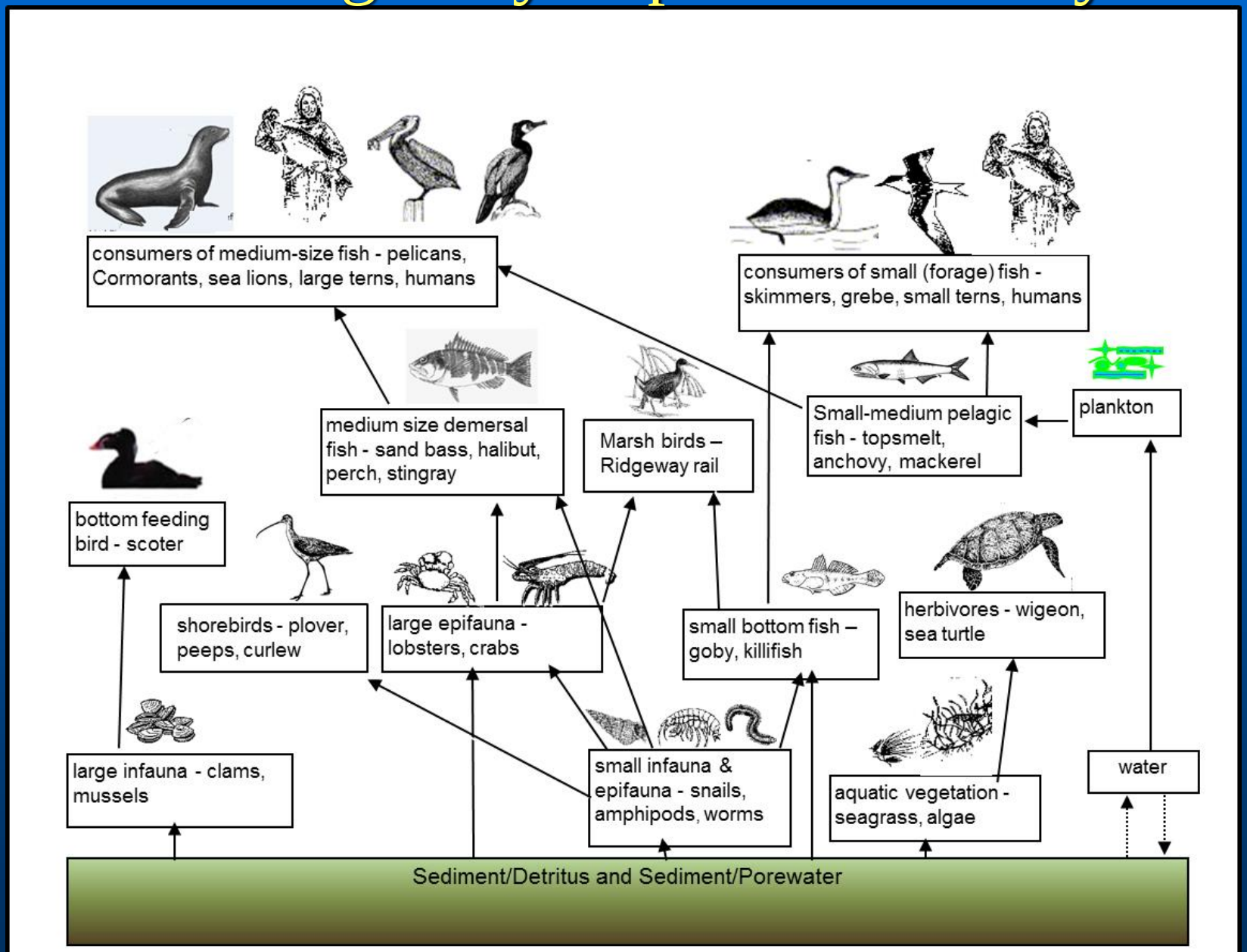
Bioaccumulation Importance

- **Many contaminants accumulate in organisms and biomagnify through the food chain (PCBs, DDT, mercury, selenium)**
- **Impacts to wildlife (birds and mammals) and human health are of high concern**
- **Regional contamination and wildlife impacts have improved over time in So. Calif., but many data gaps remain**
  - **Local conditions (e.g., San Diego Bay)**
  - **Contaminants of emerging concern (e.g., PBDE flame retardants)**
  - **Trends over time**

Bioaccumulation Importance (Cont.)

- **Elevated concentrations still exist in fish within harbors and bays**
- **San Diego Bay has a diverse environment supporting a wide variety of beneficial uses**

San Diego Bay Exposure Pathways



San Diego Bay Bioaccumulation Study

- **Three major study elements**
  1. **Food web contamination patterns**
     - **What are current levels of food web contamination?**
     - **Do conditions vary among Bay regions?**
  2. **Potential risk to wildlife**
  3. **Potential risk to human health**
- **Integrated data from new and ongoing programs**
  - **Regional monitoring**
  - **Special studies**
- **Supplemented by Water Board funding**
- **Sampling in 2013 - 15**

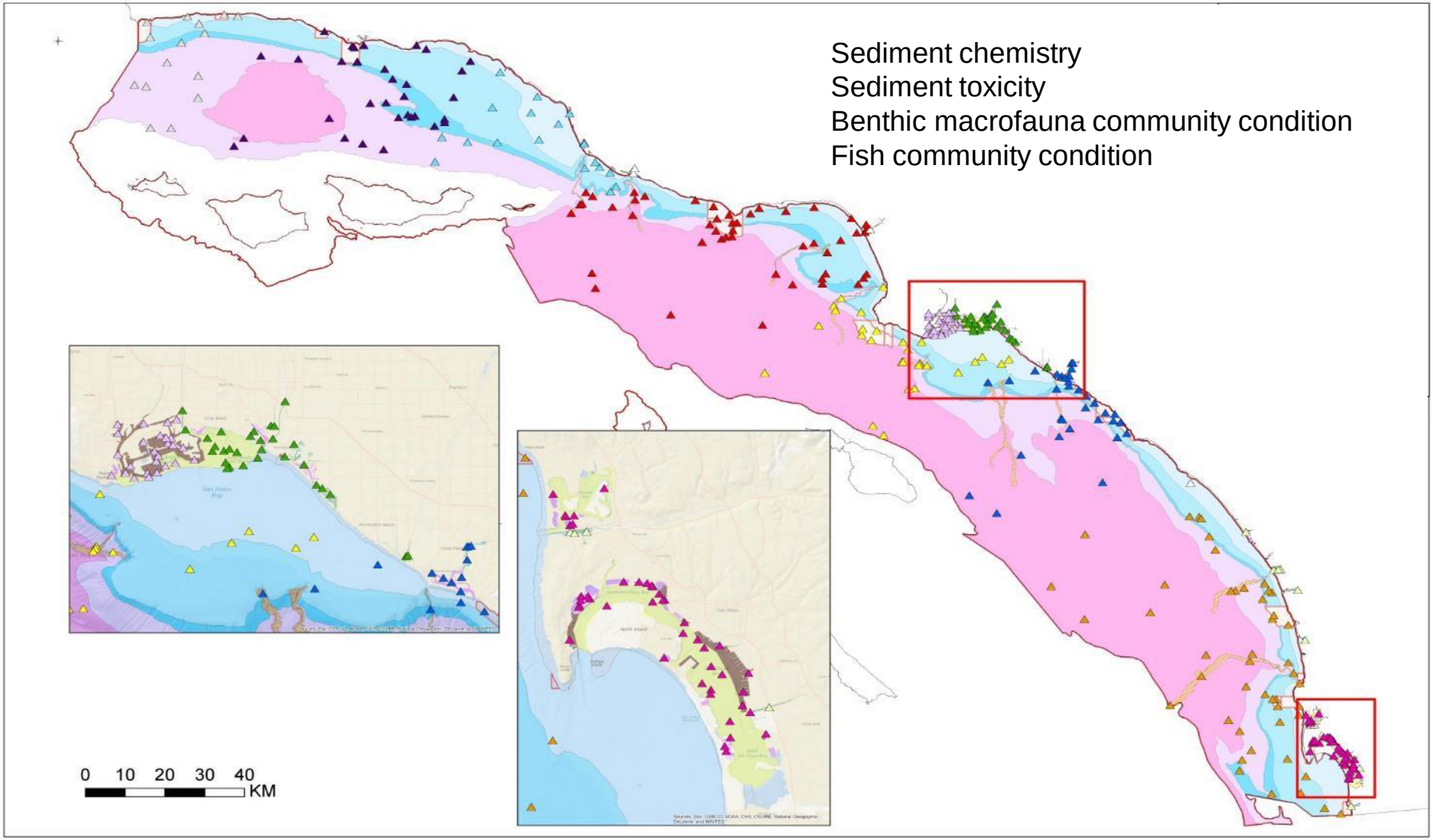
1. Food Web Contamination Study

- **Combined efforts of three programs to conduct a comprehensive study of food web contamination**
  - **Bight ‘13 regional monitoring program**
  - **Regional harbor monitoring program**
  - **Shallow water habitat survey**
- **Sampling in 2013 and 2014**
- **2 Primary objectives**
  - **Document contaminant transfer through San Diego Bay food web elements**
  - **Describe variations among Bay regions**

2013 So. Calif. Bight Regional Survey

- **Cooperative regional monitoring survey every 5 years to assess coastal contaminant trends and impacts**
  - **Sediment contamination impacts primary focus**
- **2013 Survey included regional assessment of bird egg contamination**
  - **Additional studies of food web contamination in San Diego and Newport Bays**
- **Partnership with 2013 regional surveys provided a unique opportunity to investigate bioaccumulation processes in San Diego Bay**

Bight '13 Regional Monitoring Program



Regional Harbor Monitoring Program

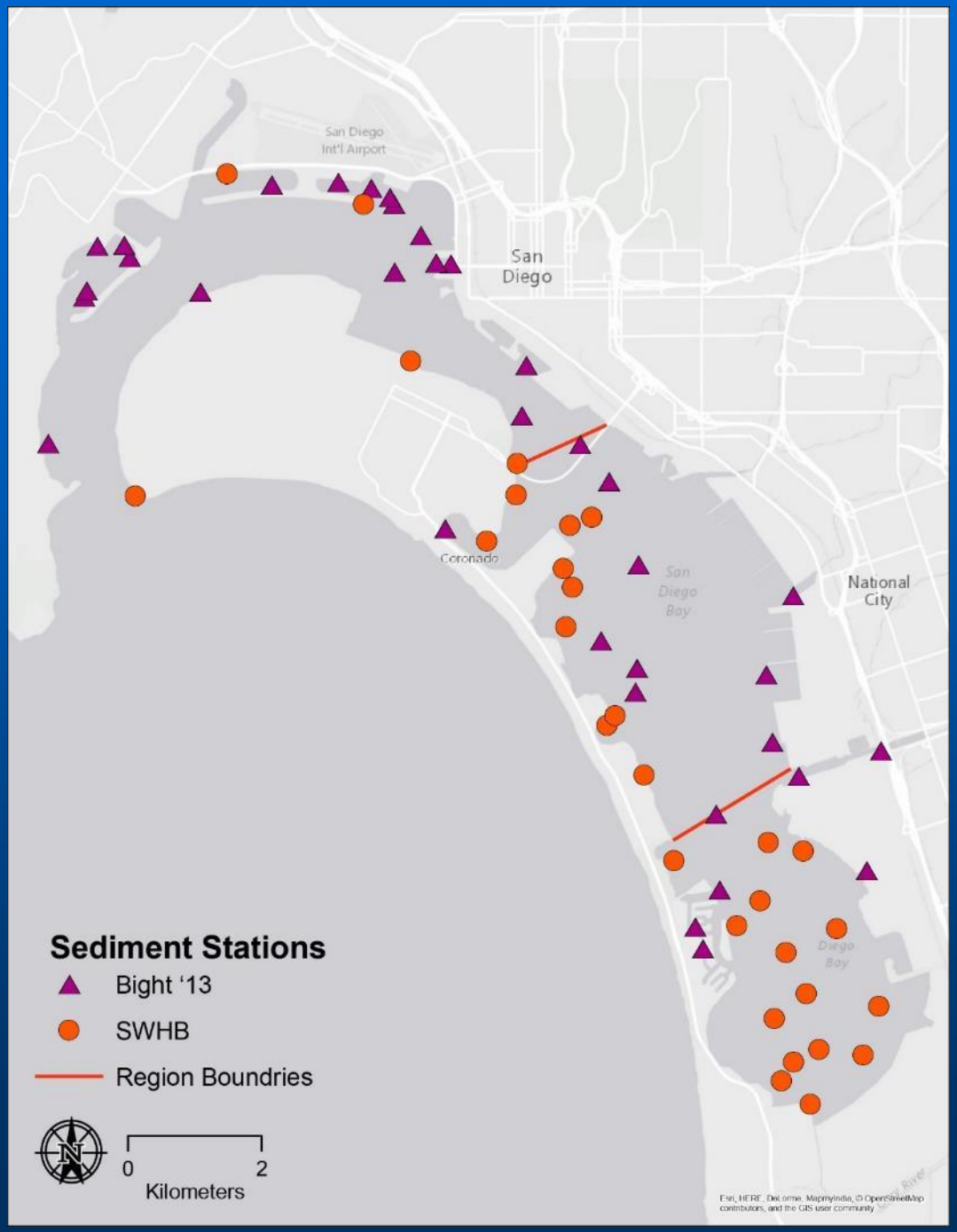
- **Collaborative assessment of environmental conditions in harbors regulated by San Diego Water Board**
  - **San Diego Bay, Mission Bay, Oceanside Harbor, and Dana Pt. Harbor**
- **Coordinated with Bight ‘13 to enhance San Diego Bay sampling**
  - **Food web sampling and chemical analysis**
  - **Additional sediment sampling and chemical analysis**

Shallow Water Habitat and Plankton Surveys

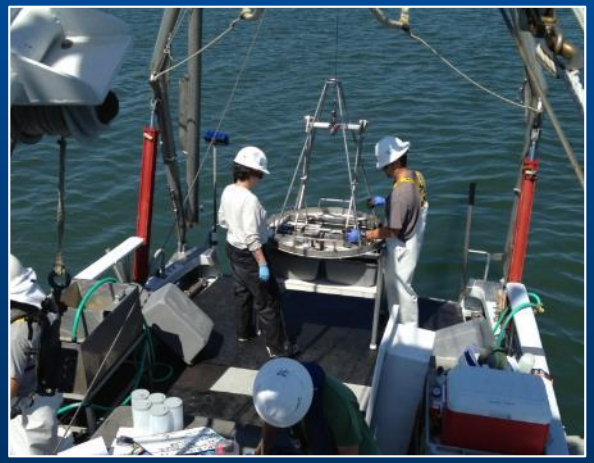
- **Funding from City of San Diego to fill sampling gaps**
  - **Shallow areas important for bird foraging and fish habitat**
  - **Plankton collection**
- **2014 Sampling**

Sediment

- **Three bay subregions**
  - **North, Central, South**
  - **Surface sediment**
- **Different habitats and uses**
  - **Marina, Port**
  - **Open bay, shallow**



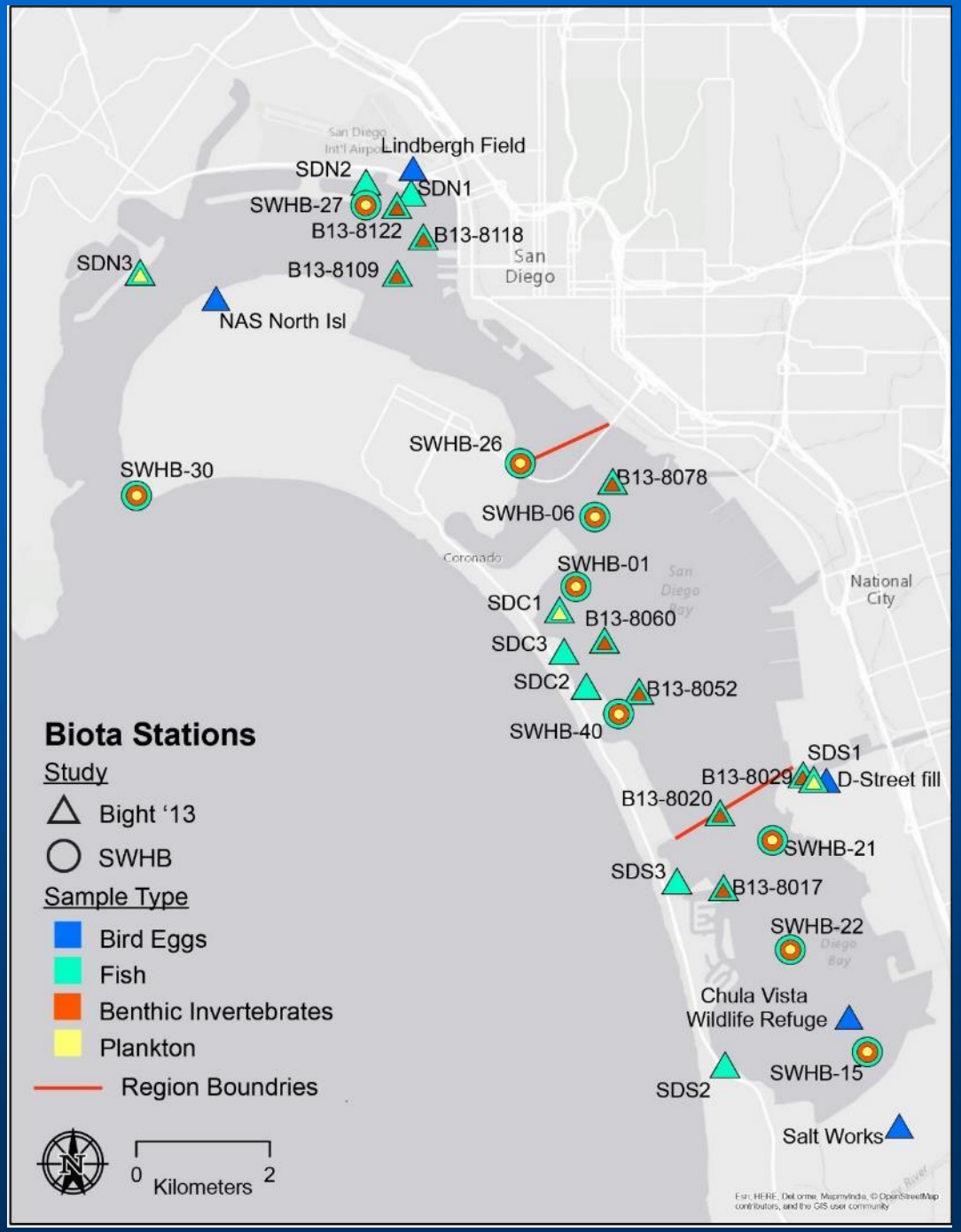
Sediment Sampling



Photos courtesy of Amec Foster Wheeler

Tissue

- Multiple food web elements
- Matched sediment and biota samples from each region
- Includes shallow and deep areas



Fish Sampling

Photos courtesy of Amec Foster Wheeler

Catch Examples

California halibut

Spotted sand bass

Anchovy

Topsmelt

Molluscs

Crustaceans

Polychaetes

Photos courtesy of Amec Foster Wheeler

Species Summary

Pelagic Fish and Invertebrates

- Anchovy
- Topsmelt
- Mackerel
- Zooplankton

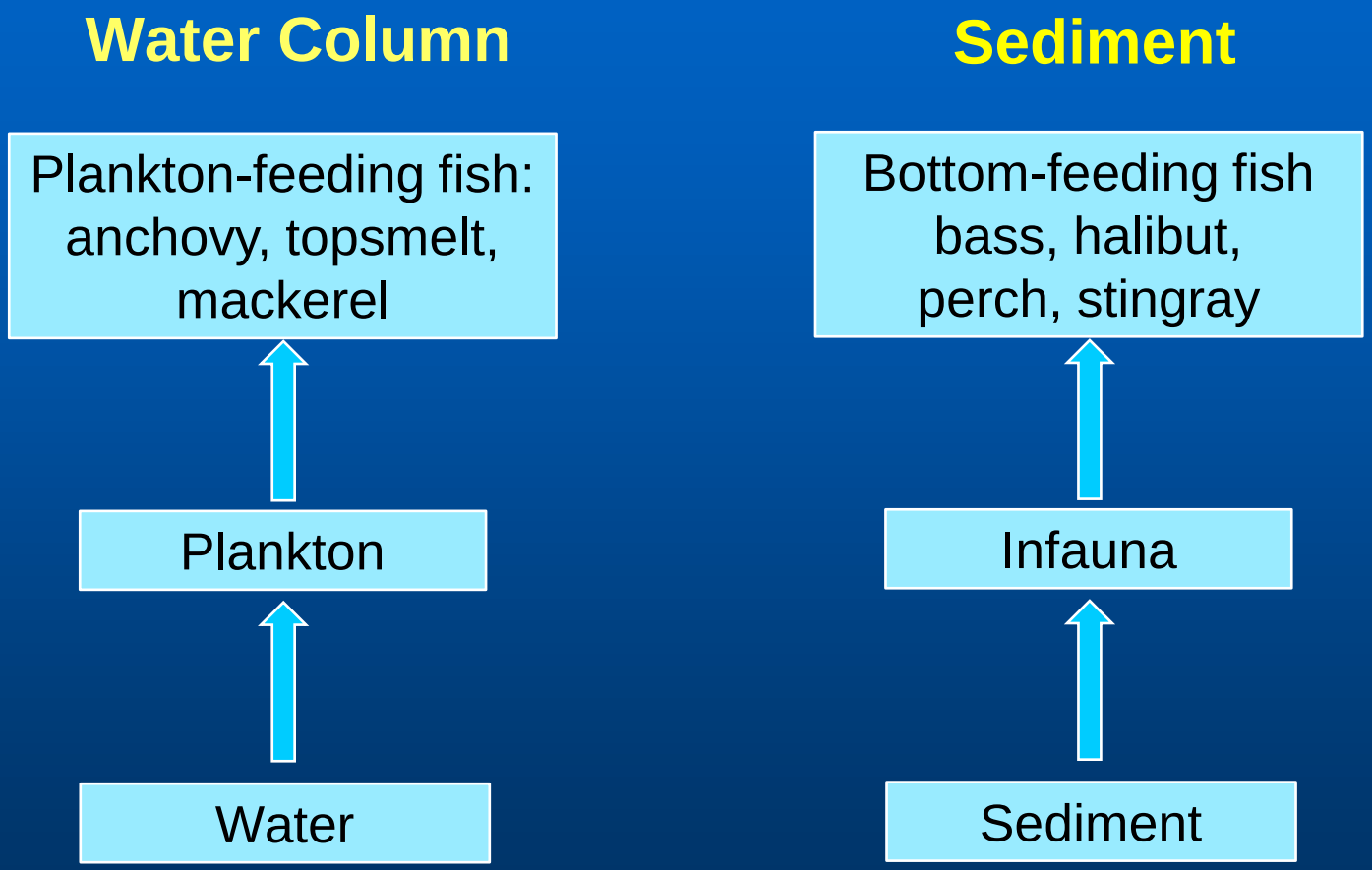
Sediment-Dwelling Invertebrates

- Polychaetes
- Mollusks
- Crustaceans

Bottom Fish

- Barred Sand Bass
- Spotted Sand Bass
- California Halibut
- Perch
- Stingray
- Gobies
- Killifish

Bioaccumulation Pathways



Chemical Analyses

Sediment

- Trace metals
  - 15 metals including mercury, selenium, copper, lead, and zinc
- Trace organics
  - PCB congeners
  - DDTs and other pesticides
  - Petroleum compounds (PAHs)
  - Flame retardants (PBDEs)
- Total organic carbon
- Particle size

Tissue

- Trace metals
  - Mercury
- Trace organics
  - PCB congeners
  - DDTs, Chlordanes, dieldrin
  - PAHs (some samples)
  - PBDEs and other CECs
- Lipid

Data will be publicly available

2. Wildlife Risk Study

- **Sampled eggs at 5 locations in San Diego Bay**
  - **Subset of 12 sites studied for Bight ‘13**
  - **Collect abandoned eggs at end of nesting**
  - **Analyzed for Chlordanes, PCBs, DDTs, PBDEs, Hg**
- **Four species representing different life history/feeding strategies**
- **Sampling in 2013**
- **2 types of risk analyses**
  - **Egg contamination and risk to offspring**
  - **Diet contamination and risk to adults**

Target Species

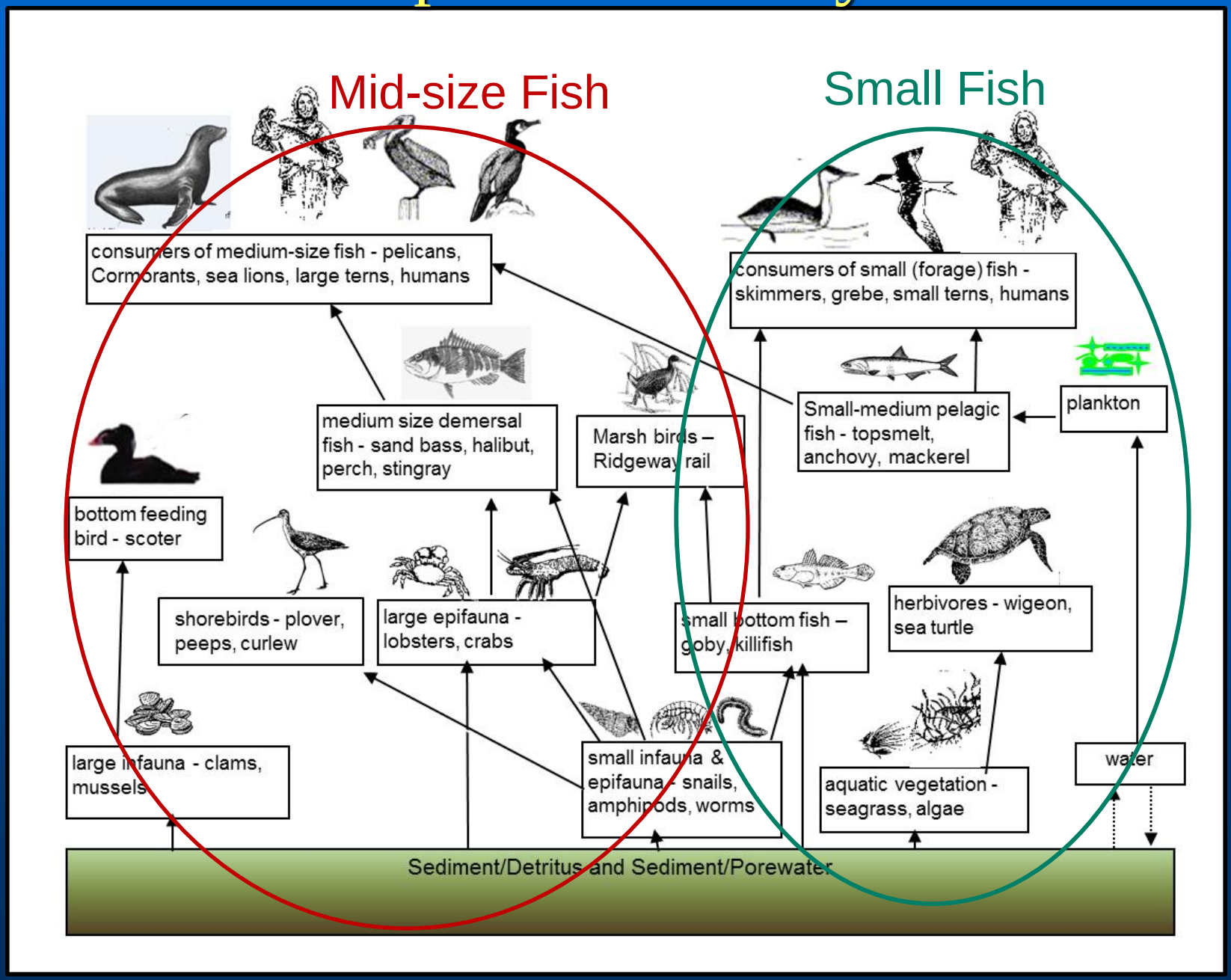
Pelagic forager: Caspian Tern

Benthic forager: Cormorant

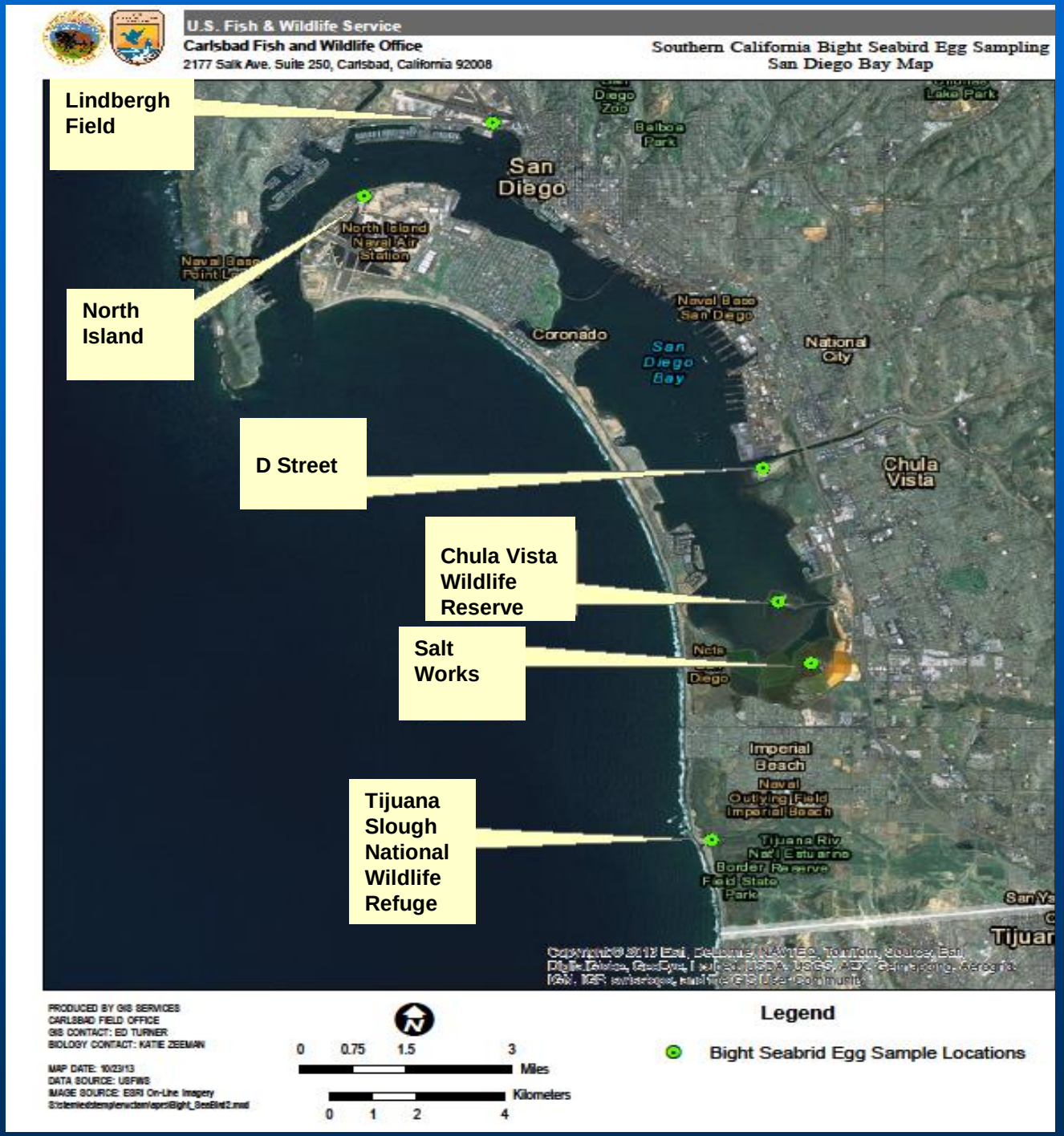
Mixed forager: Western Gull

Species of special concern: CA Least Tern

Exposure Pathways

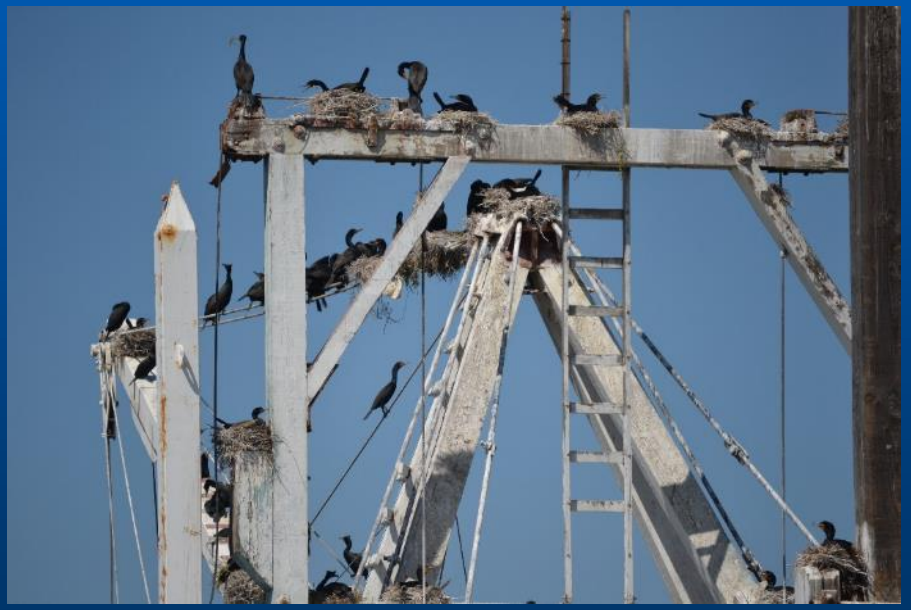


2013 Bird Egg Sampling Locations



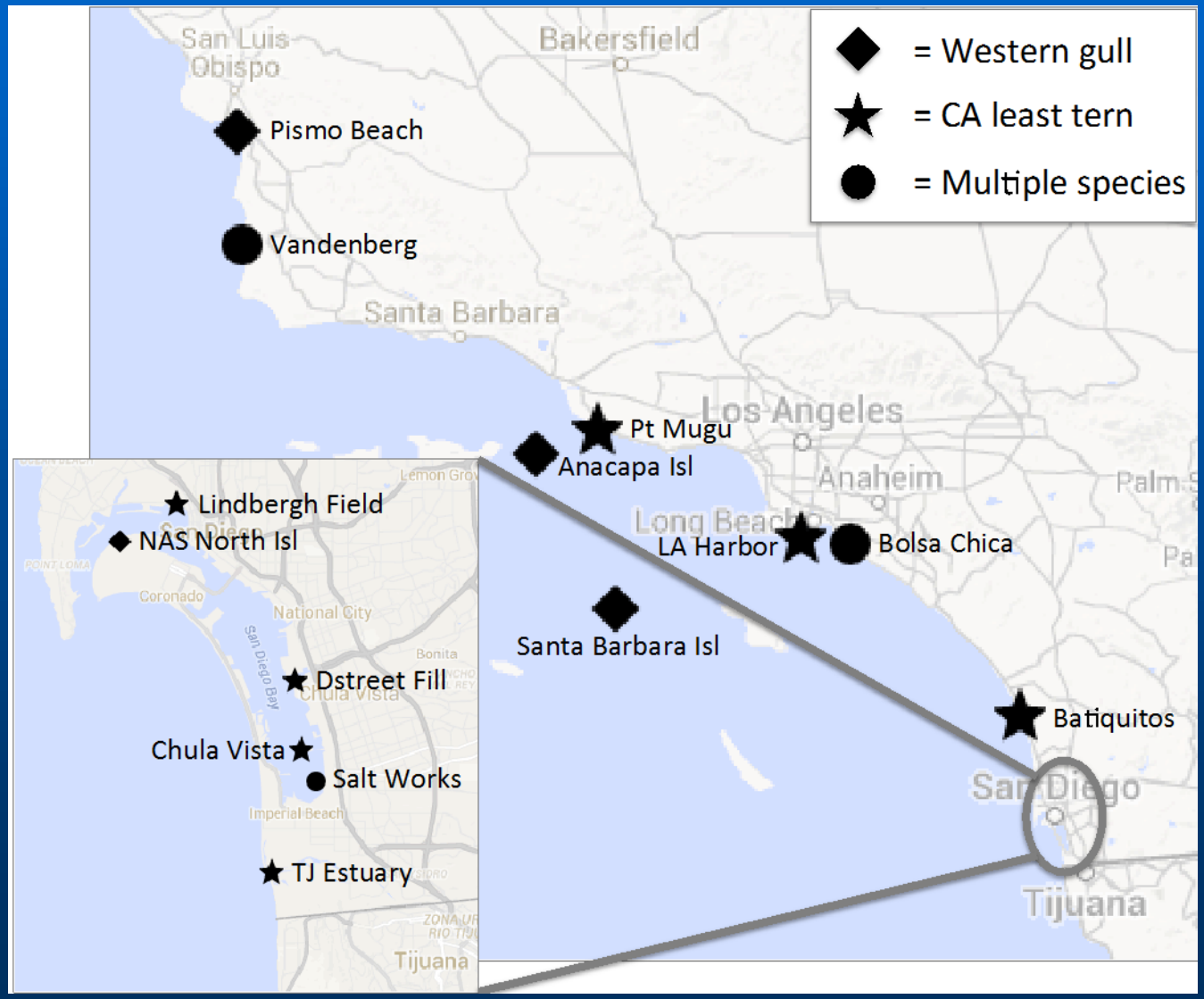
San Diego Bay Nest Sites

Lea Squires



Brian Collins/USFWS

So Calif Bight Bird Nesting Sites



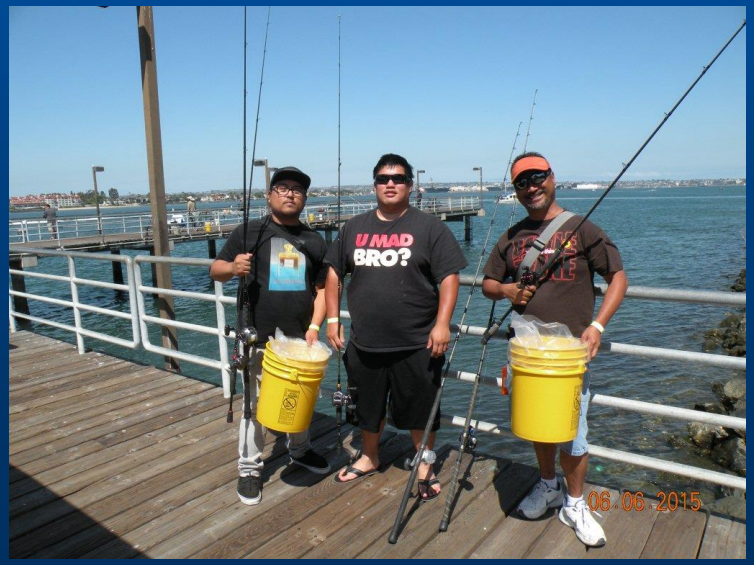
3. Human Health Risk Study

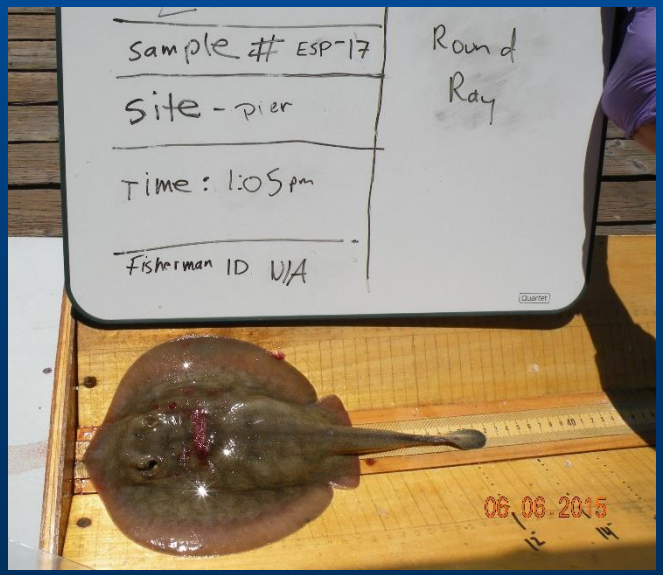
- **Collected samples of common sport fish**
  - **Spotted sand bass, halibut, topsmelt, round stingray**
  - **PCBs, DDTs, chlordanes, dieldrin**
- **Sampling in 2014 and 2015**
  - **Boats, piers, and shore**
- **2 types of analyses**
  - **Comparison to seafood advisory tissue levels**
  - **Evaluation of potential cancer risk and linkage to sediment contamination**

Sampling Methods

- **Collected fish using typical methods**
  - **Rod and reel**
  - **Boats and public access shore locations**
- **Included undersize fish**
  - **Halibut**
  - **Spotted sand bass**
- **Multiple sampling events**
  - **Guided boat fishing**
  - **Fishing derby**

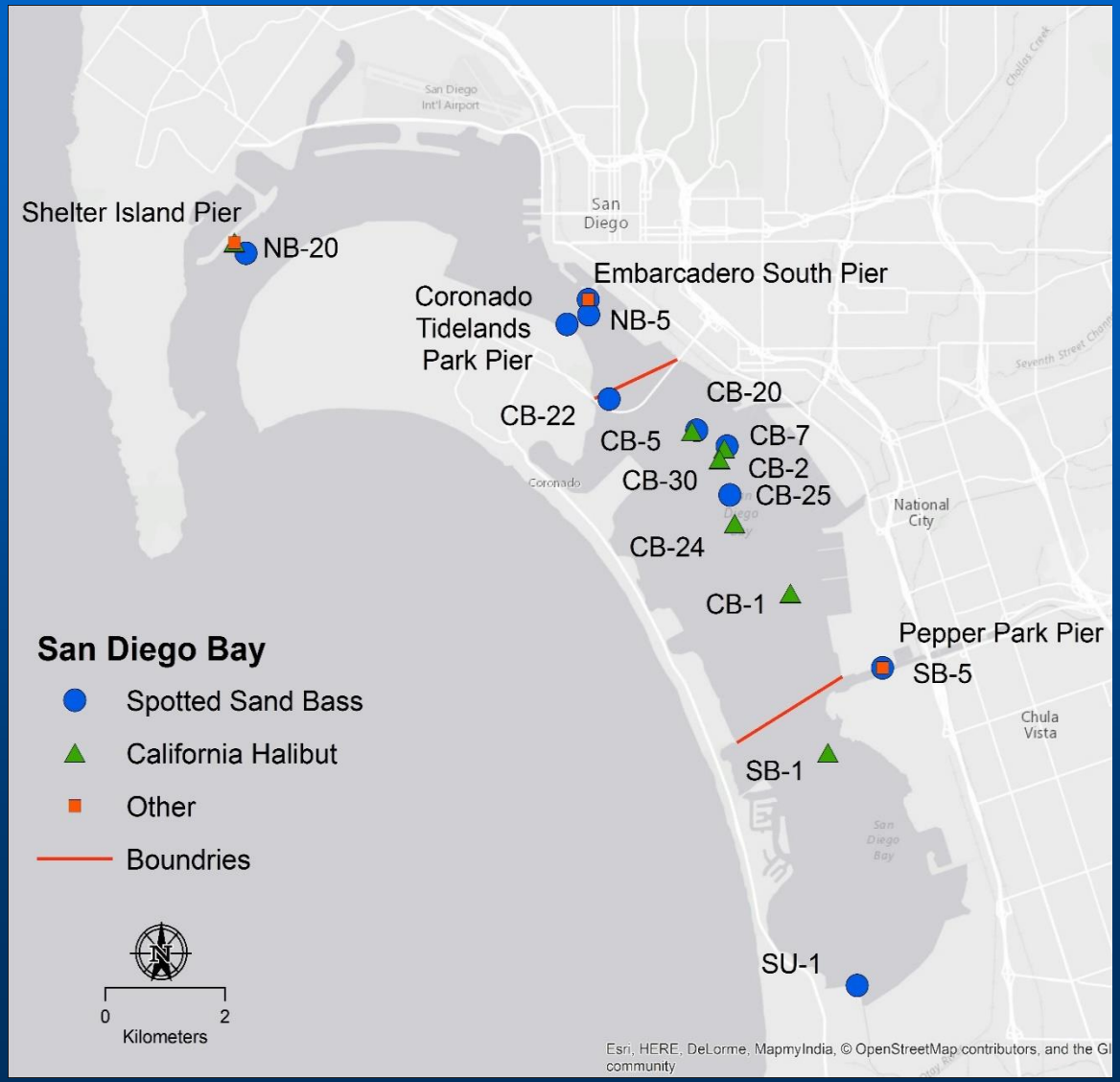
Sportfish Sampling





Sport Fish Sample Locations

- **Chemical analysis for PCBs, DDTs, mercury, Chlordanes, and dieldrin**
- **Composites of 5 fish**
  - **Individual halibut**
  - **Fillet or whole body (depending on size)**



Study Products

- **Final report**
  - **Draft report available from Water Board**
  - **External peer review in progress**
- **Project data**
  - **CEDEN (in progress)**
  - **Project data set (in preparation)**

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