Coastal Water Quality Monitoring in the Southern California Bight

Southern California Coastal Ocean Observing System

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Where and What is SCCOOS?

- **Southern California Coastal Ocean Observing System**

A collaborative network of scientists and research teams from universities, government, NGOs, and industry that collect, aggregate, enhance, and share information on the coastal ocean.

The Southern California Bight extends from Point Conception (Santa Barbara Area) to the US/Mexico Border.

SCCOOS program office is located at Scripps Institution of Oceanography in La Jolla, California.
The Integrated Ocean Observing System or IOOS was born from the Integrated Coastal and Ocean Observation Act of 2009.

**Where and What is SCCOOS?**

SCCOOS is part of the U.S. Integrated Ocean Observing System.

This law designated **11 regional associations** that act as a science-based decision support system.

![Map of SCCOOS and its Collaborative Network of Ocean Observations](image)

### Our Collaborative Network of Ocean Observations

- Ocean Acidification Monitoring (2014)
- High Frequency Radar (2005)
- Harmful Algal Bloom Monitoring (2005)
- Automated Shore Stations (2005)
- CDIP Wave Buoys (1978)
- CalCOFI* (1949)
What does SCCOOS do?

SCCOOS is like a regional weather monitoring system for the ocean. We produce real-time data and models to help you plan & live better.
What does SCCOOS do? We produce an “end-to-end” coastal ocean observing system to benefit society in four broad focus areas.
In support of the West Coast shellfish industry, the OOSes have added OA and hypoxia monitoring to their ongoing observations. As part of this project, SCCOOS maintains a CO2 analyzer "Burkolor" located at Carlsbad Aquafarm, reporting alkalinity, CO2, TCO2, omega aragonite saturation, salinity, and water temperature. Additional funding was awarded through a West Coast OOS joint proposal, continuing the operation of the instrument by a SCCOOS subject matter expert (SME).

In 2004, CalCOFI added 9 SCCOOS stations to the standard 66 station pattern.

Stations are on the 20m isobath:
- Temperature
- Salinity
- Dissolved oxygen
- Chlorophyll-a fluorescence
- Transmittance
- Nitrate
- PAR

Net tows occur at every SCCOOS station.

Marine mammal and sea bird visual surveys are conducted during transits between stations as well as marine mammal recordings.

Ocean Acidification SCCOOS co-funds nearshore CalCOFI stations to obtain a fuller suite of ecosystem variables on a quarterly basis.
In support of the West Coast shellfish industry, the OOSes have added OA and hypoxia monitoring to their ongoing observations. As part of this project, SCCOOS maintains a CO₂ analyzer ("Burkeolator") located at Carlsbad Aquafarm, reporting alkalinity, CO₂, TCO₂, aragonite saturation, salinity, and water temperature. Additional funding was awarded through a West Coast OOS joint proposal, continuing the operation of the instrument by a SCCOOS subject matter expert (SME).
Ocean Acidification  

SCCOOS is monitoring the entire carbonate chemistry system in lagoon waters that feed the shellfish at Carlsbad Aquafarm.

- **pCO2**
- **Total CO2**
- **Salinity**
- **pH**
- **Aragonite Saturation**
- **Alkalinity**

Prelim data, Kenisha Shipley
Automated Shore Stations **SCCOOS monitors shore stations in Southern California for physical and basic biological parameters**

http://www.sccoos.org/data/autoss/
Harmful Algal Blooms *SCCOOS monitors shore stations in Southern California for toxins from phytoplankton (algae) and measures environmental conditions at piers*

Weekly HABMAP measurements:
- Chl-a, Temp, Salinity, Nutrients
- HAB species (8 species)
- Domoic Acid

http://www.sccoos.org/data/habs/
Harmful Algal Blooms The C-HARM system predicts where the deadly neurotoxin, domoic acid, is likely to be in coastal California, much like a weather forecast.

California Harmful Algae Risk Mapping (C-HARM) System
http://www.cencoos.org/data/models/habs

Operational product at NOAA CoastWatch by June 2018

Pseudo-nitzschia Nowcast

Particulate Domoic Acid Nowcast
Harmful Algal Blooms  *SCCOOS* will soon be hosting a bi-weekly *HAB Bulletin* that synthesizes model output and observations for all of coastal California.
Coastal Pollution  

SCCOOS creates a plume tracking tool for people to follow the possible flow of pollution from Tijuana River Estuary into the Pacific Ocean.

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**Imperial Beach Sewage Spill**

335,000 gallons of raw sewage

May 2017
Data Visualization and Decision Making

http://www.sccoos.org/data/tracking/IB/

<table>
<thead>
<tr>
<th>Station ID</th>
<th>Station Name</th>
<th>Particle Count</th>
<th>Plume Potential</th>
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<tbody>
<tr>
<td>1</td>
<td>Coronado (North Island)</td>
<td>0</td>
<td>NO</td>
</tr>
<tr>
<td>2</td>
<td>Silver Strand</td>
<td>0</td>
<td>NO</td>
</tr>
<tr>
<td>3</td>
<td>Silver Strand Beach</td>
<td>0</td>
<td>NO</td>
</tr>
<tr>
<td>4</td>
<td>Carnation Ave.</td>
<td>0</td>
<td>NO</td>
</tr>
<tr>
<td>5</td>
<td>Imperial Beach Pier</td>
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</tr>
<tr>
<td>6</td>
<td>Cortez Ave.</td>
<td>0</td>
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</tr>
<tr>
<td>7</td>
<td>End of Seacoast Dr.</td>
<td>1</td>
<td>YES</td>
</tr>
<tr>
<td>8</td>
<td>3/4 mi. N. of TJ River Mouth</td>
<td>55</td>
<td>YES</td>
</tr>
<tr>
<td>9</td>
<td>Tijuana River Mouth</td>
<td>180</td>
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<tr>
<td>10</td>
<td>Monument Rd.</td>
<td>101</td>
<td>YES</td>
</tr>
<tr>
<td>11</td>
<td>Board Fence</td>
<td>214</td>
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Coastal Pollution: SCCOOS monitored the 2006 & 2015 Hyperion Outfall Diversion

2015 Hyperion Outfall Diversion

Real-time tracking:
Los Angeles Hyperion sewage outfall diversion

Geography of the Hyperion 5-mile diversion

Plume Tracking

COAMPS 4km Modelled 10m Wind Fields
Coastal Pollution: **SCCOOS monitored the 2006 & 2015 Hyperion Outfall Diversion**

http://www.sccoos.org/projects/hyperion/

<table>
<thead>
<tr>
<th>Station Name</th>
<th>Beach</th>
<th>Total Coliforms</th>
<th>Fecal Coliforms</th>
<th>Enterococcus</th>
<th>EG/TC Ratio</th>
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<tr>
<td>SMB MC-2</td>
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<td>Pass</td>
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<tr>
<td>SMB 2-3</td>
<td>Will Rodgers SB</td>
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<td>Pass</td>
<td>Pass</td>
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<tr>
<td>SMB 2-7</td>
<td>SM Cyn SD, SM SB</td>
<td>Pass</td>
<td>Pass</td>
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<td>SMB 2-8</td>
<td>Venice Pier, Venice Bch</td>
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<tr>
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<tr>
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<tr>
<td>SMB 6-5</td>
<td>Ave I, Redondo Bch</td>
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<td>SMB 6-6</td>
<td>Malaga Cove</td>
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</tbody>
</table>

**Satellite October 29, 2015**

Aqua-MODIS Chlorophyll-a (chl-a), remote sensing reflectance at 555 nm (Rrs) and sea surface temperature (SST) from Oct. 29, 2015 at 14:41:55 PDT, during the diversion. An area of high chl-a is seen north of the outfall pipes and along the coast of Santa Monica Bay. There is also a smaller bloom circulating off the tip of San Pedro. These high signatures are also seen in the Rrs image at the 555 nm wavelength. These areas are also correlated with regions of cooler SST.
Coastal Pollution: SCCOOS monitored the 2006 & 2015 Hyperion Outfall Diversion

Cross-shelf transect of water quality measured by CTD water profiler on October 26. The effluent plume can be seen prominently in the upper 2-3 m of the water above the outfall and more diffuse inshore.
ASBS’s are state water quality protected areas that, by legislative order, are not allowed to “receive discharges of waste” and must “maintain natural water quality.” There is concern that plumes from these much larger watersheds may be transported into ASBS, altering natural water quality.
Areas of Special Biological Significance

In 2008, the City of San Diego, the University of California San Diego, Scripps Institution of Oceanography, and San Diego Coastkeeper authored a Watershed Management Plan four essential and interactive components.

1. Urban Runoff Management
2. Ocean Ecosystem Assessment
3. Information Systems
4. Public Participation

Problem Statement: Areas outside of ASBS have an affect on ASBS Water Quality

HF Radar currents compute trajectories from Los Peñasquitos with a 3-day lifetime of FIB
Areas of Special Biological Significance

Funding for the project has been provided in part through a grant from the State Water Resources Control Board (SWRCB). The development of the Watershed Management Plan came from California Proposition 50.

This plan was prepared by the La Jolla Shores Watershed Management Group

- Scripps Institution of Oceanography
- University of California San Diego
- City of San Diego
- San Diego Coastkeeper

Project Manager

Urban Runoff Mgmt
City of San Diego
UCSD

ASBS Ecosystem Mgmt
SIO

Information Management
SIO

Public Participation
San Diego Coastkeeper

Point La Jolla
ASBS 29
City of San Diego
ASBS 31
Scripps Institution of Oceanography
ASSESSMENT CHALLENGES

Management Decision Impacts: Is change within the ASBS a result of the management decision?
External Human Influences: Are they present? Are they avoidable? Are they external to the ASBS?
Natural Variability: Are observed changes caused by natural variability? E.g. – climate change?
Since some of the data shown on the website are derived from other sources, the goal has been to provide direct access to disparate data streams. The portal is flexible and accommodates all file types.
As you think about new or improved data portals, please consider SCCOOS as a resource
DO NOT RE-INVENT THE WHEEL!

Other entities to be aware of with portals!
- West Coast Regional Planning Body
- IOOS Pacific Region Ocean Acidification (IPACOA)
- Marine Biodiversity Observation Network (MBON)
- Central and Northern California Ocean Observing System (CeNCOOS)

QUESTIONS?