



National Marine Sanctuary West Coast Observing Activities

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West Coast Sanctuary Emerging Topics

- ✓ Assessing the condition of the 5 west coast sanctuaries
- ✓ IEA development and the application of ecosystem models (Atlantis) to sanctuary management
- ✓ Ocean acidification effects on sanctuary resources and the role of sanctuaries as sentential sites for monitoring and research
- ✓ Supporting analysis of existing data from sanctuary observing platforms

Sanctuary Condition Reports

Water Quality Status and Trends



Trends:

- ▲ Conditions appear to be improving. ? Undetermined trend.
- Conditions do not appear to be changing. N/A Question not applicable.
- ▼ Conditions appear to be declining.

#	Status	Rating	Basis For Judgement	Description of Findings
1.	Stressors	?	Hypoxic conditions may be increasing in frequency and spatial extent in nearshore waters.	Selected conditions may preclude full development of living resource assemblages and habitats, but are not likely to cause substantial or persistent declines.
2.	Eutrophic Condition	—	No suspected human influence on harmful algal blooms or eutrophication.	Conditions do not appear to have the potential to negatively affect living resources or habitat quality.
3.	Human Health	—	Naturally occurring harmful algal blooms result in periodic shellfish closures.	Selected conditions that have the potential to affect human health may exist, but human impacts have not been reported.
4.	Human Activities	—	Threat of oil spills from vessels.	Some potentially harmful activities exist, but they do not appear to have had a negative effect on water quality.

Supporting IEA Development

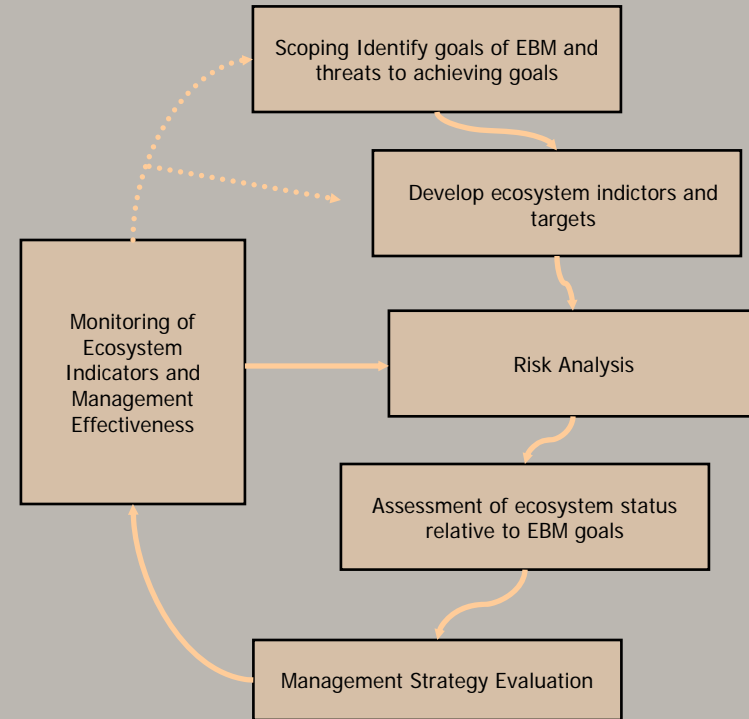
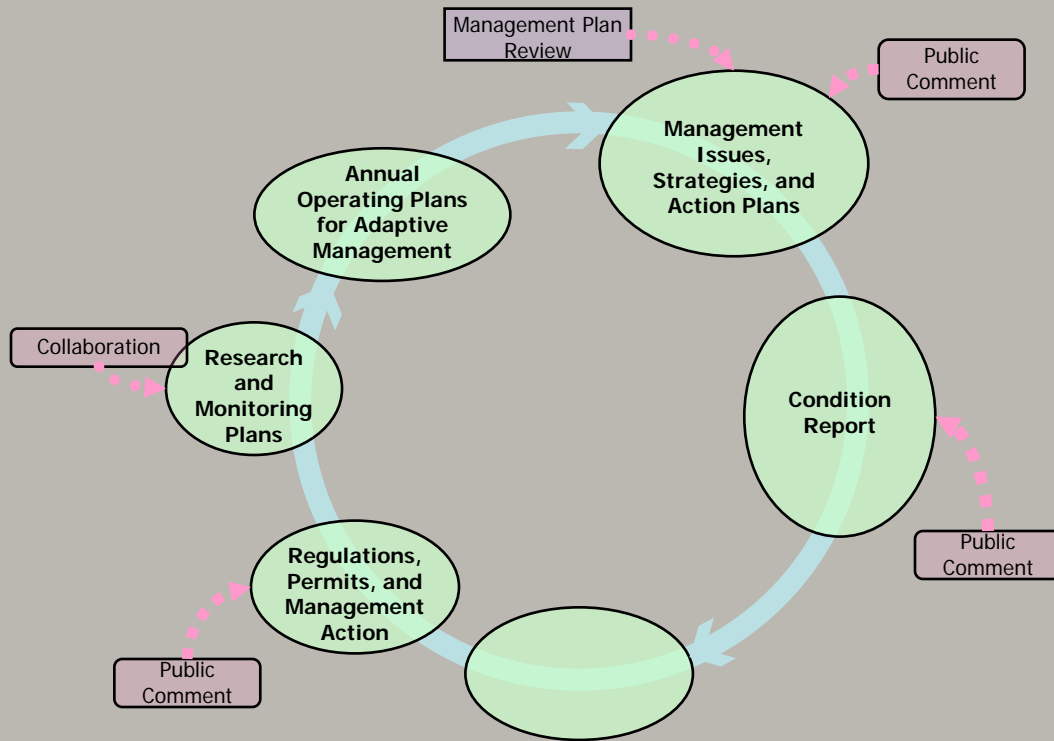
- ✓ Understand how management requirements relate to Ecosystem Assessments at different scales
- ✓ Investigate how existing IOOS capabilities inform IEA development

Tasks

- Review relevant spatial scales of existing IEA-type activities
- Apply DPSIR approach to California Current example
- Identify key ecosystem management applications
- Identify supporting data sets and observing gaps

Sanctuary Management Approach

Integrated Ecosystem Assessment



California Current LME Level:

- 1) Atlantis NCCE Model
- 2) California Current IEA, Module I
- 3) NCEAS CCME Human Impacts Assessment

Ecosystem Region Level:

- 1) NCEAS Human Impacts Assessment
6 regions
- 2) Atlantis Ecosystem Model
Central CA region

Management Unit Level:

- 1) Atlantis Puget Sound Model
- 2) ONMS SWiM Condition Reports
5 sites (*)
- 3) NCEAS Human Impacts Assessment
1 site (^)

Local Level: Monterey Bay

- 1) MBCORC Virtual Monterey Bay
- 2) MBCORC Report Card

WA

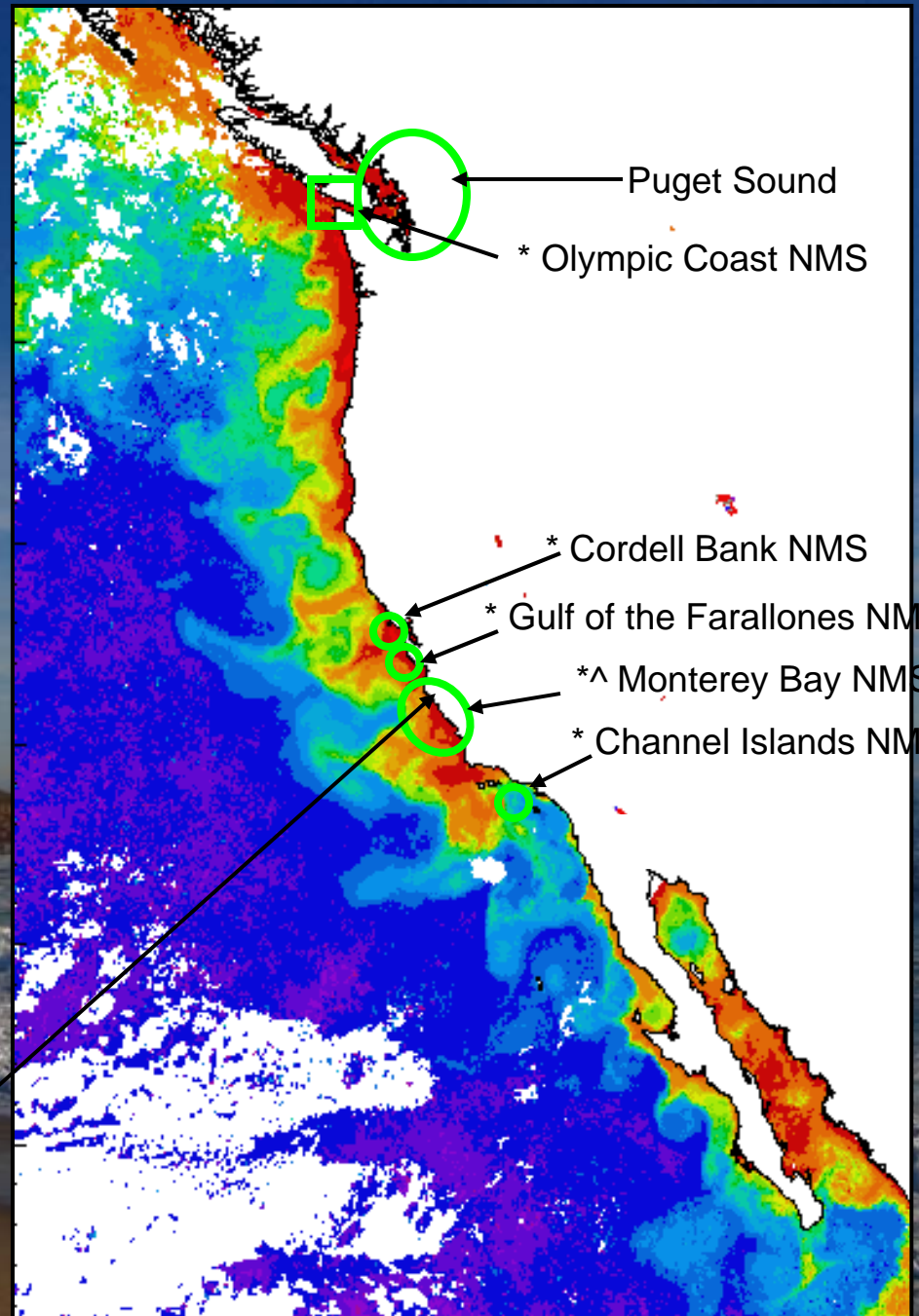
OR

N CA

C CA

S CA

Baja



Puget Sound

* Olympic Coast NMS

* Cordell Bank NMS

* Gulf of the Farallones NMS

*^ Monterey Bay NMS

* Channel Islands NMS

Table 6. Drivers and pressures identified in the condition reports for Olympic Coast (OC), Cordell Bank (CB), Gulf of the Farallones (GF), Monterey Bay (MB), and Channel Islands (CI) National Marine Sanctuaries. Grey shading used to identify the three sanctuaries that occur in the central California sub-region. X = current pressure; E = emerging pressure

Drivers	Pressures	OC	CB	GF	MB	CI	Potential impacts
Maritime trade (vessel traffic, cruise ships, marinas, sunken vessels); Petroleum exploration, production, and refining.	Oil and hazardous material spill	X	X	X	X	X	wildlife injury and mortality (seabirds, marine mammals, intertidal communities); habitat degradation (physical and biogenic); fishing closures; water quality; reductions in tourism and local economy
Maritime trade; National security (military operations)	Vessel traffic	X	X	X	X	X	noise pollution (see below); oil or hazardous material spill; lost containers and other large debris; Disturbance to wildlife (e.g., mammals, sharks); Collisions with mammals, turtles
Commerce and development	Global climate change	E	X		E	X	sea level rise, temperature increase, acidification, etc.; changes in species distribution, primary productivity, community composition, etc.
Oceanographic conditions	Natural shifts in climate: seasonal, annual, and longer-term (ENSO/PDO)	X	X			X	shifts in prey availability and distribution; altered body condition, survivorship and reproductive success; shifts in migratory patterns and timing
Maritime trade; Seafood consumption (aquaculture, harvesting); Aquarium trade; Research; Restoration	Non-indigenous species	X	X	X	X	E	competing with or preying on native and harvested species; altering species composition; altering ecosystem function; habitat degradation; disrupting commercial and recreational activities; introduction and spread of infectious disease
Livestock and agriculture; Maritime commerce (marinas and cruise ships); Coastal development	Biological contamination (biotoxins/harmful algal blooms, bacteria, protozoa, viruses)	X	X	X	X	X	contamination of water, habitat and food chain; health impacts to animals and humans; beach closures

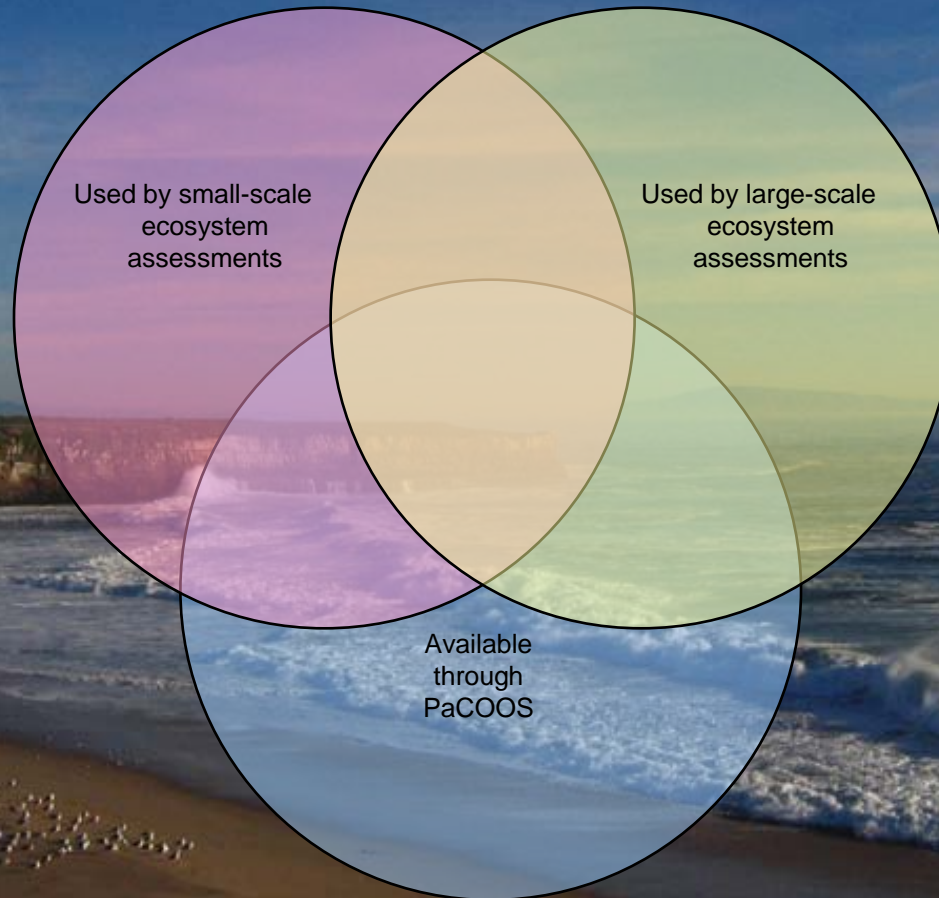
Table 7. Datasets used to assess the current condition of water, habitat, and living resources as identified in the condition report for the Olympic Coast National Marine Sanctuary (NOAA 2008)

Questions	Indicators	Source
Water		
1) Are specific or multiple stressors, including changing oceanographic and atmospheric conditions, affecting water quality?		
	dissolved oxygen	physical oceanography monitoring stations (OCNMS monitoring data); long-term dataset in sanctuary waters lacking
	dead crabs, fish kills	reported observations (Quinalt Natural Resources Department)
	seawater acidity (pH), water temperature, current direction and velocity, fluorometry, conductivity	Wootton unpublished data, Grantham et al. 2004, Barth et al. 2007, Chan et al. 2008; physical oceanography monitoring stations (OCNMS monitoring data)
	HABs/domoic acid levels in razor clams	monitoring since early 1990s (Washington Department of Fish and Wildlife); long-term dataset not available
	chemicals in water, sediment and biota at 30 stations in OCNMS	30 stations sampled as part of EMAP in 2003 (Partridge 2007); long-term monitoring of some chemicals (NOAA's Status and Trends, Mussel Watch Program (ID 88))
2) What is the eutrophic condition of sanctuary waters and how is it changing?		
	nutrient concentrations in coastal waters (long-term datasets and sufficient instrumentation are lacking - trend unknown)	EMAP 2003/Partridge 2007
	water circulation/nutrients/primary production/HABs	satellite imagery (temperature, color), buoy data in and near OCNMS; Foreman et al. 2007, MacFadyen et al. 2008
3) Do sanctuary waters pose risks to human health?		
	biotoxins (PSP and ASP) in shellfish	routine monitoring since 1991 (coastal tribes and Washington Department of Health)
	Harmful Algal Blooms	monitoring began in the 1990s (Juan de Fuca Eddy Steering Committee 2004; Trainer 2005; Trainer & Suddeson 2005)
	bacteria (e.g. fecal coliform, E. coli, Enterococcus) in marine waters	Washington Department of Health 2008; Surfrider's Blue water task force 2003-05; limited monitoring
4) What are the levels of human activities that may influence water quality and how are they changing?		
		Canadian vessel traffic system at mouth of Strait of Juan

Table 12. Observing datasets that are being used by one or more of the on-going ecosystem assessment efforts in the California Current Ecosystem. Datasets that are currently hosted by PaCOOS (<http://www.pacoos.org/DataMgt.htm>) are indicated and highlighted in yellow.

Project Name	Project Description	Available though PaCOOS	ONMS SWiM Condition Reports	Module 1, CCE IEA	Atlantis NCCE model	NCEAS CCME Human Impact Assessment	MBCO RC Report Card	ID #
West Coast Observatories (WCObs)	WCObs deals with oceanographic data collected at the five west coast sanctuaries. The project began in 2004 and focuses on various data streams collected at instrument moorings.	X						1
Beach COMBERS	Beach COMBERS (Coastal Ocean Marine Mammal & Bird Education and Research Surveys) uses volunteers to survey beached marine birds and mammals monthly at selected beach segments in central and southern portions of Monterey Bay sanctuary.		MB				X	2
Center for Integrated Marine Technologies (CIMT)	CIMT simultaneously collected data on physical, chemical, and biological (from phytoplankton to marine mammals) via moorings, shipboard surveys, apex predator tagging and tracking, and satellite, aircraft, and land-based remote sensing in Monterey Bay from 2002-2007 and was built on a foundation of data collection initiated in 1997.	CTD & Chloro only	MB	X			X	3
MBARI Ocean Observing System (MOOS)	Since 1989 Monterey Bay Aquarium Research Institute (MBARI) has operated a mooring observing system in Monterey Bay.	X	MB				X	6
California Sea Otter Survey	Bi-annual aerial and land-based standardized surveys of Southern sea otters have been conducted in California (from Santa Barbara to Half Moon Bay) during late spring and early fall since 1983.		MB				X	7
Naval Postgraduate School HF Radar	HF radar hardware and software have allowed examination of circulation in Monterey Bay since 1994.	X						8
WA Annual Kelp Surveys	Aerial photographs taken in the late summer are used to monitor maximum bed extent of floating kelp along the Strait of Juan de Fuca, and outer coast in the Olympic Coast sanctuary. Data collected by Washington State Department of Natural Resources in 1989-1992 and 1994-present.	X	OC					9

Availability and Use of Observing Data in Ecosystem Assessments



Sanctuary Observing Data

- ✓ Observing assets in 5 west coast sanctuaries + Vessel Observations
- ✓ NCDDC provides data processing, documentation archiving, accessing
- ✓ (NCDDC Metadata course in December at Sand Point)
- ✓ Need support for analysis of existing data from the observing platforms

Oceanographic Characterization of OCNMS

http://ccma.nos.noaa.gov/ecosystems/sanctuaries/olympic_nms.html

