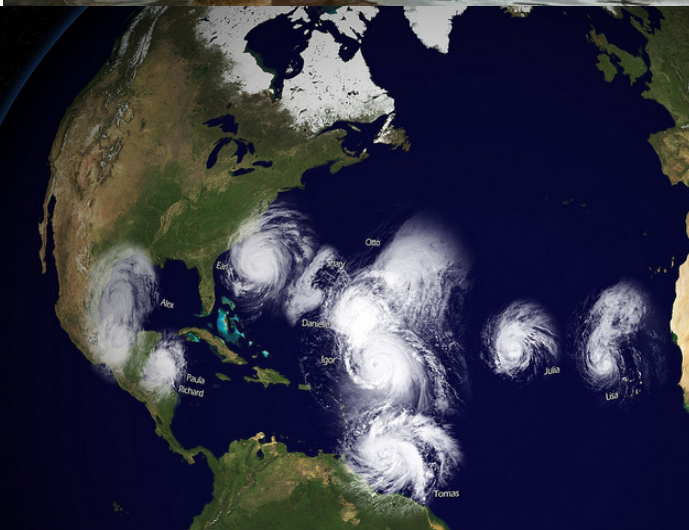


Networks to Study Environmental Change: US IOOS[®]



**Enabling decision making
every day;
Fostering advances in
science and technology**



**OBFS-NAML
2014 Joint Meeting**

**Chris Kinkade
NOAA National Ocean Service**



U.S. IOOS[®]: Program Overview

WHO

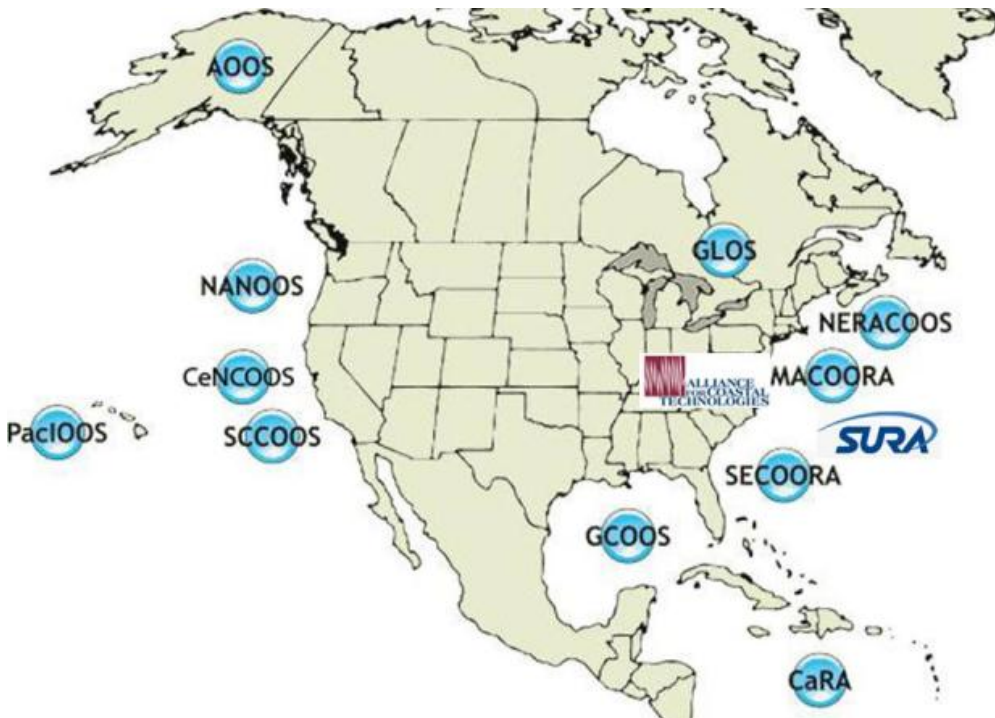


WHAT

- Observations
- Data Management
- Modeling and Analysis

WHY: 7 Goals, 1 System

Weather and climate change
Maritime operations
Natural hazards
Homeland security
Public health risks
Healthy coastal ecosystems
Sustain Living Marine Resources



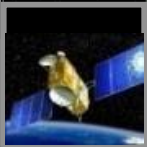
WHERE: Global and Coastal Components



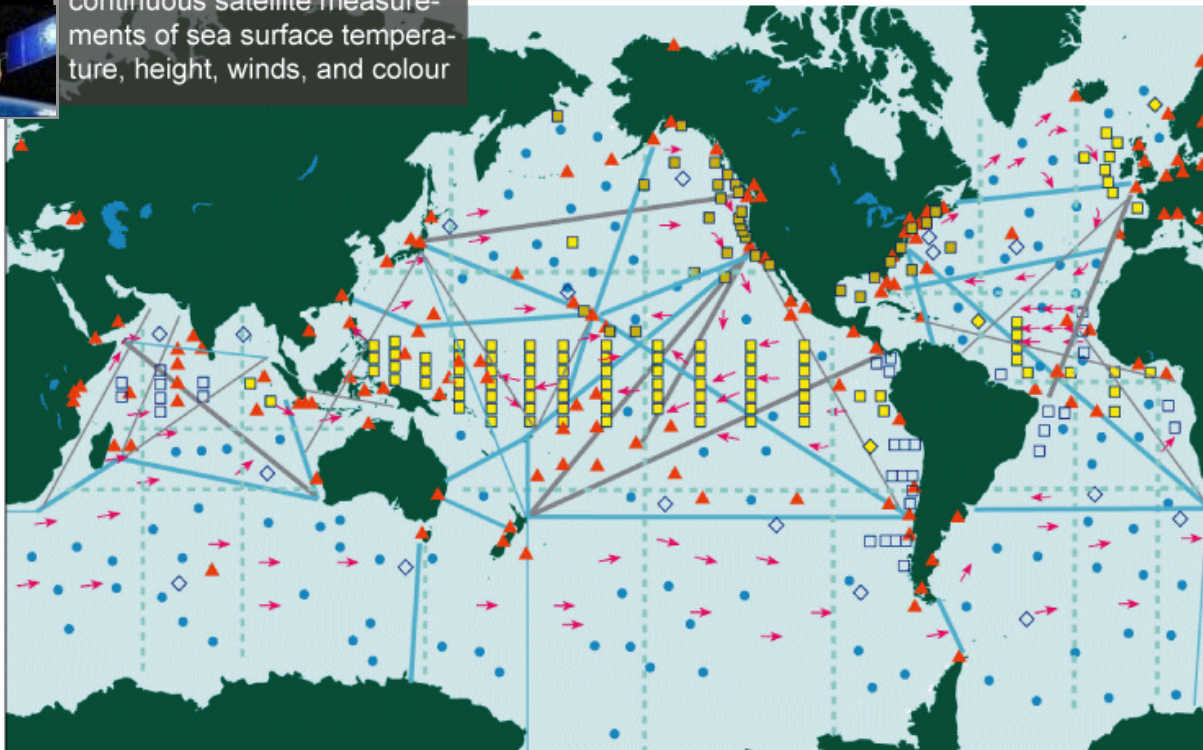
Enhances science and improves decision making

Global Component: Global Ocean Observing System for Climate

Total *in situ* networks **61%**



continuous satellite measurements of sea surface temperature, height, winds, and colour



87% Surface measurements from volunteer ships (VOSclim)

200 ships in pilot project



100% Global drifting surface buoy array

5° resolution array: 1250 floats



59% Tide gauge network (GCOS subset of GLOSS core network)

170 real-time reporting gauges



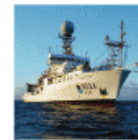
81% XBT sub-surface temperature section network

51 lines occupied



100% Profiling float network (Argo)

3° resolution array: 3000 floats



62% Repeat hydrography and carbon inventory

Full ocean survey in 10 years

Reference time series **48%**

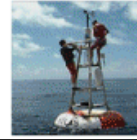


58 sites

Global reference mooring network **34%**



29 moorings planned



73% Global tropical moored buoy network



119 moorings planned



U.S. IOOS[®]: Regional Component

IOOS Regional Component

Focused on:
Marine Operations
Coastal Hazards
Climate Variability &
Change
Ecosystems,
Fisheries, Water
Quality

Comprised of State,
Local Tribal
governments;
Academia; Private
Sector



- Meeting National missions through...
 - Expanded observations and modeling capacity
 - Connections to users and stakeholders
 - Implementation of national data standards
 - Products transitioned to other regions and to National operations

26 coastal and ocean variables within IOOS' mission

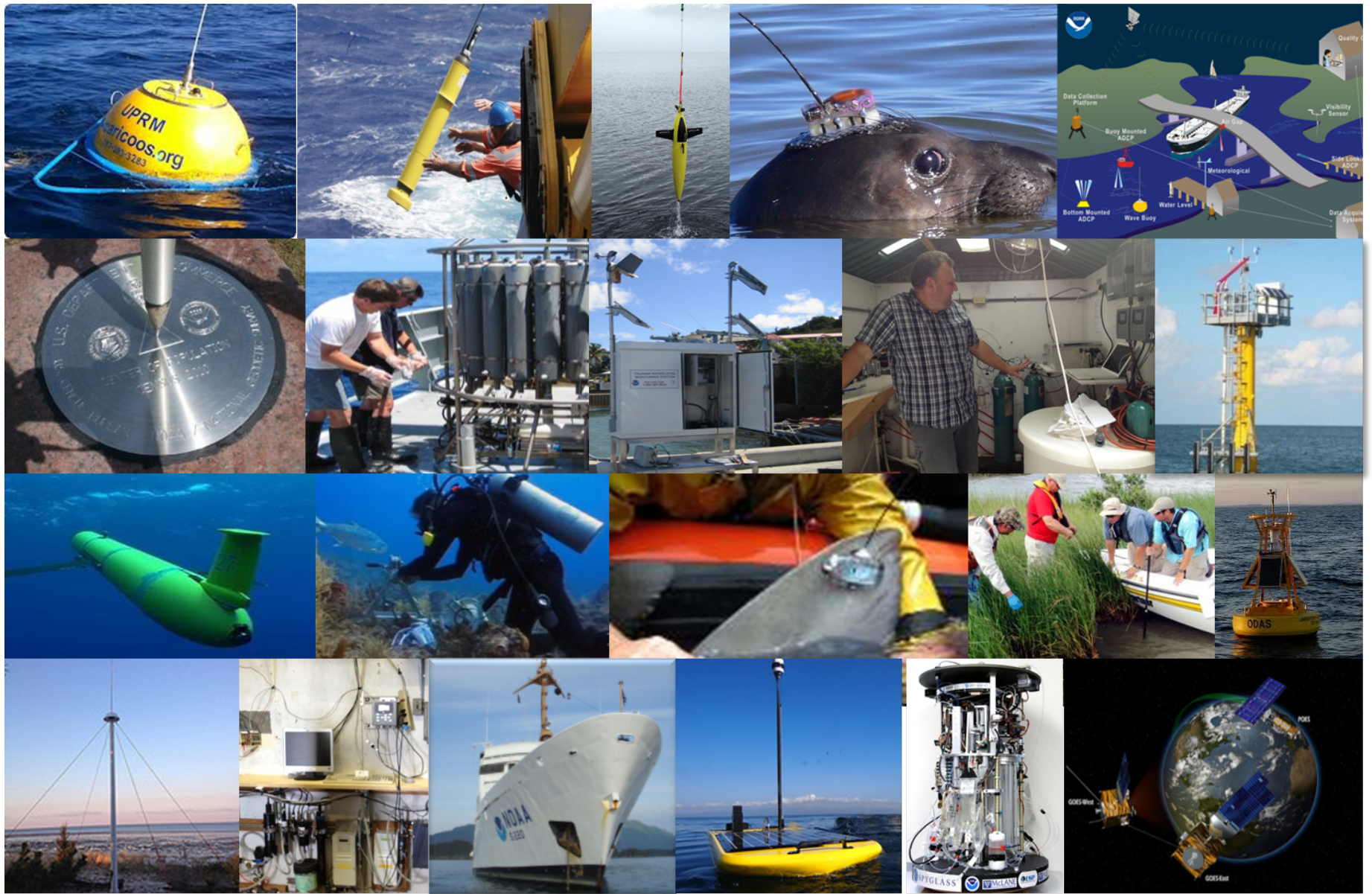
Table 3. The 26 High-Priority Variables to Meet the Seven Societal Goals.

	CORE VARIABLE	WEATHER AND CLIMATE	MARINE OPERATIONS	NATURAL HAZARDS	NATIONAL SECURITY	PUBLIC HEALTH	HEALTHY ECOSYSTEMS	SUSTAINED RESOURCES
CORE VARIABLES IDENTIFIED AT AIRLIE HOUSE	SALINITY	X	X	X	X	X	X	X
	TEMPERATURE	X	X	X		X	X	X
	BATHYMETRY	X	X	X	X	X	X	X
	SEA LEVEL	X	X	X	X		X	X
	SURFACE WAVES	X	X	X	X	X	X	X
	SURFACE CURRENTS	X	X	X	X	X	X	X
	ICE DISTRIBUTION	X	X	X	X			
	CONTAMINANTS				X	X	X	X
	DISSOLVED NUTRIENTS					X	X	X
	FISH SPECIES						X	X
	FISH ABUNDANCE						X	X
	ZOOPLANKTON SPECIES					X	X	X
	OPTICAL PROPERTIES				X	X	X	X
	HEAT FLUX	X					X	X
	OCEAN COLOR	X	X				X	X
	BOTTOM CHARACTER	X	X				X	X
	PATHOGENS				X	X	X	X
	DISSOLVED OXYGEN						X	X
	PHYTOPLANKTON SPECIES	X	X		X	X	X	X
ZOOPLANKTON ABUNDANCE						X	X	
ADDITIONAL CORE VARIABLES ADDED POST-AIRLIE HOUSE	WIND SPEED AND DIRECTION	X	X	X			X	X
	STREAM FLOW	X		X			X	X
	TOTAL SUSPENDED MATTER					X	X	X
	COLORED DISSOLVED ORGANIC MATTER			X			X	X
	PARTIAL PRESSURE OF CARBON DIOXIDE (pCO ₂)	X				X	X	X
	ACIDITY (pH)	X				X	X	X

http://www.ioos.noaa.gov/about/governance/summit2012/usioos_summit_report.pdf

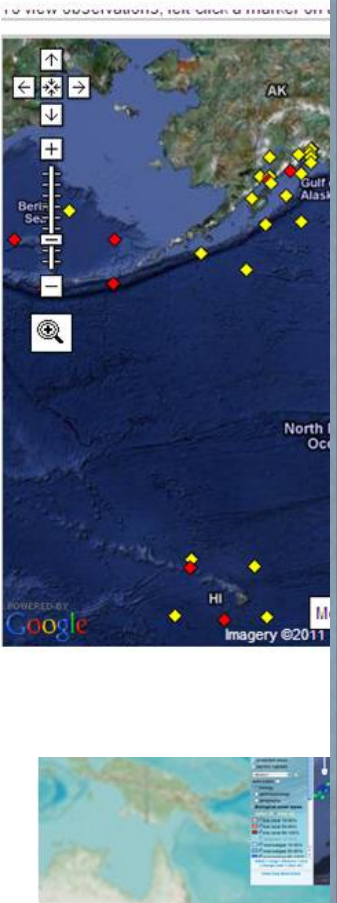
Ocean.US also recognized the need for regional leadership to sustain coastal ocean observations and in 2003 sponsored a summit to address the structure and functions of regional coordination. As a result, the Regional Associations (RAs) were recognized as a part of overall U.S. IOOS governance, and a National Federation of Regional Associations (NFRA) was formed to coordinate activities among the RAs and facilitate collaboration with the federal agencies. *The NFRA has recently changed its name, in November 2012, to the IOOS Association.*





Data Integration – Regional to National

U.S. National



IOOS Catalog [Help](#)

Service notice: We have found that Internet Explorer is slow to display this page, and we are investigating. Firefox, Safari and Chrome browsers work well.

1444 Platforms 75 Rectangles.

Variables: - All -

Cluster platforms
Click the dots for in-situ observations.
Click the rectangles for gridded data.

Recent observations (win: All)
 No observations

Filter By Date Clear Date Filter

Start: Aug 3 2010
 End: Aug 3 2010

Regions: - All regions -

Search by bounding box mode.
(Click a gridded data rectangle to filter platforms.)

Service types: - All -

Servers: - All -

Data Providers on this Server
All

Data Providers: - All -

Data Products in overlapping rectangles:
- All -

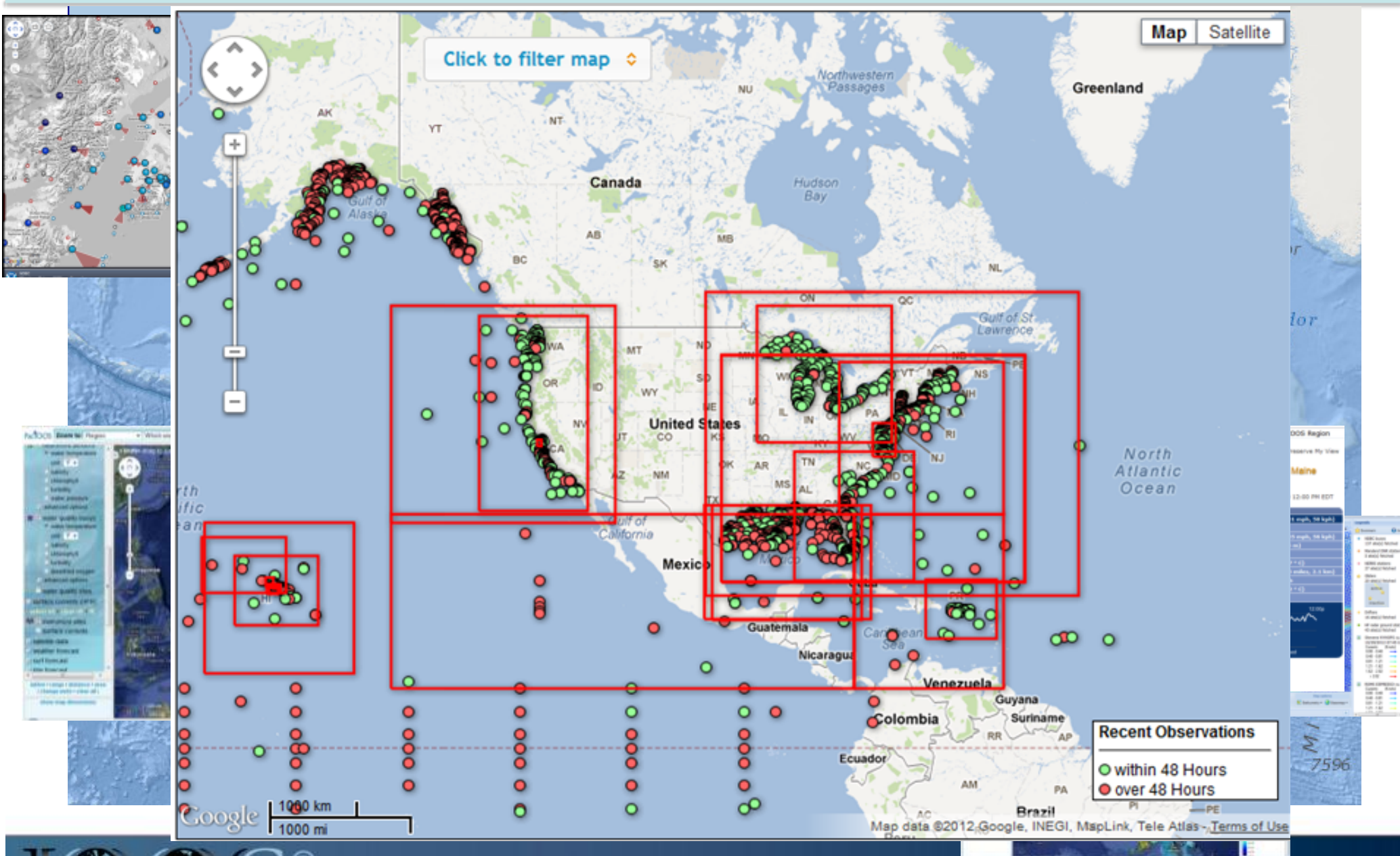
Reset

[Bookmark this view \(right click this link.\)](#)
[Documentation for IOOS gridded data services](#)
[Download all SOS Platforms \(XML\)](#)
[Download all TDS Rectangles \(XML\)](#)

Map **Satellite** Terrain
 Show labels

Imagery ©2010 TerraMetrics - Terms of Use

Exposing Ocean Information



Data Management & Communication (DMAC)

DMAC is the IOOS sub-system (standards, protocols and best practices, software, and hardware) that ensures ocean observation data can be discovered, accessed and utilized in applications to meet user needs.

- **DMAC Guiding Principles:**

- Ensure Open Data Sharing: Full and open exchange of data
- Employ a Standards-based Approach: Use community-based best practices and standards for data management
- Use Web Services: Enable discovery & access of data
- Ensure Data Stewardship
- Conduct Quality Control/Quality Assurance on all data

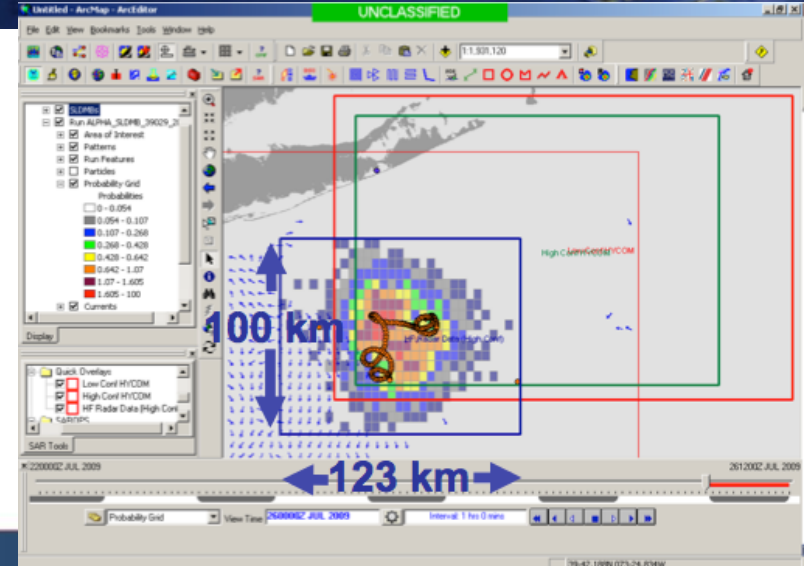
Examples of National Observing Networks

Stakeholders

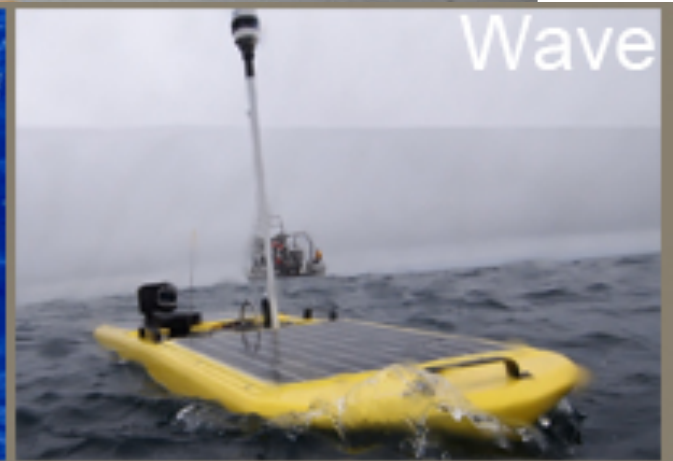
- > 30 institutions operate HF Radars; represents a Federal/State investment of \$55M in last 15 years
- Used by >40 government/private entities
- Partnership with Industry: US-based CODAR Ocean Sensor

Who Depends on it

- USCG Search and Rescue: Oil spill response
- Water quality; Criminal forensics
- Commercial marine navigation
- Offshore energy; Harmful algal blooms
- Marine fisheries
- Emerging - Maritime Domain Awareness
- Emerging – Tsunami



Examples of National Observing Networks

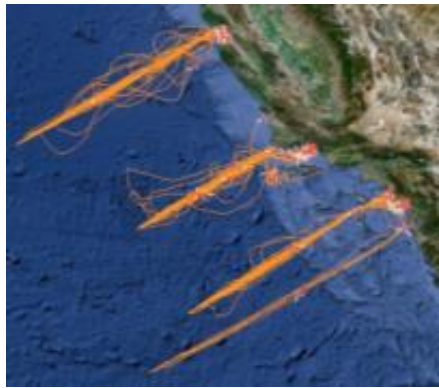


IOOS
INTEGRATED OCEAN OBSERVING SYSTEM

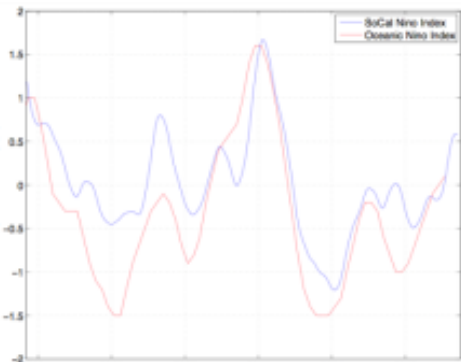
US Army Corps
of Engineers

Glider Missions

Climate/Ecosystem/Fisheries Management/Water Quality



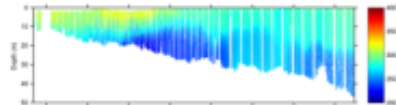
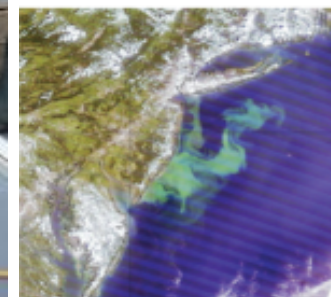
CalCOFI



The SoCal Niño Index



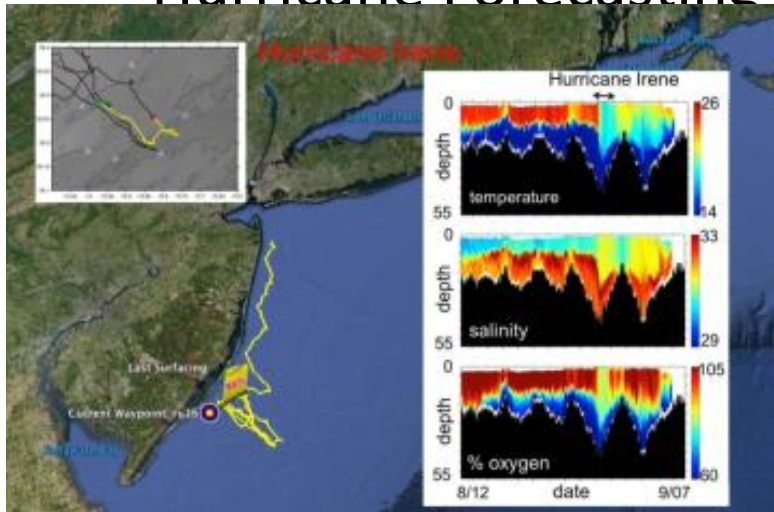
Fish Tracking



HAB



Hurricane Forecasting



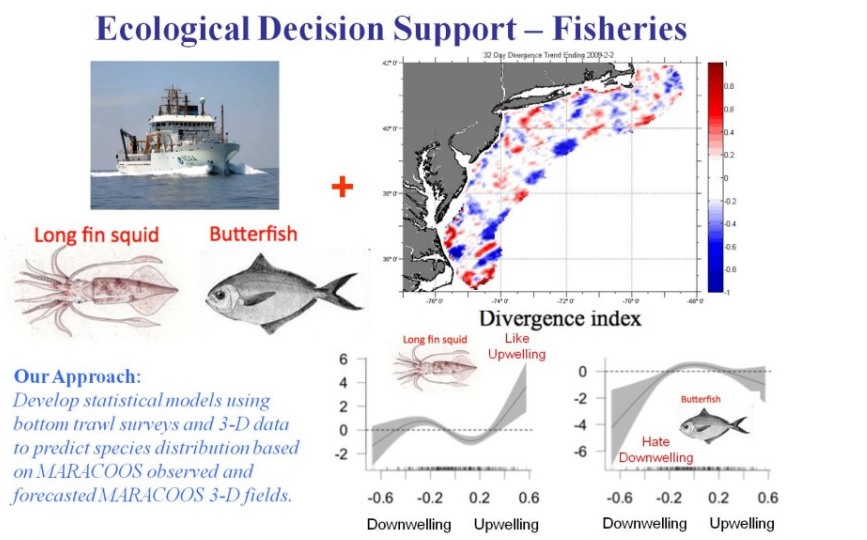
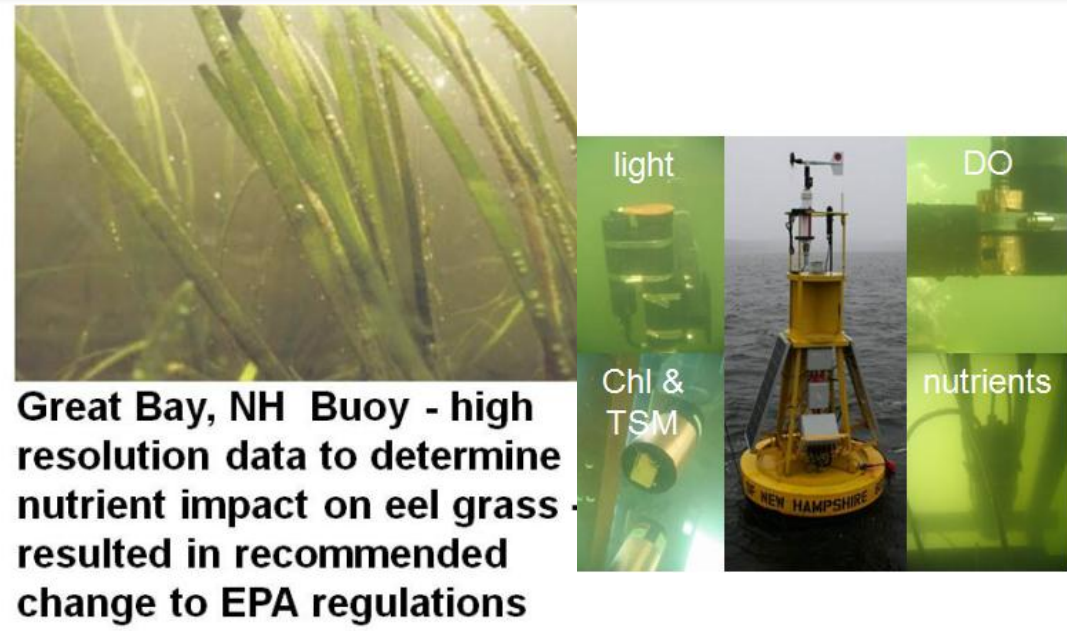
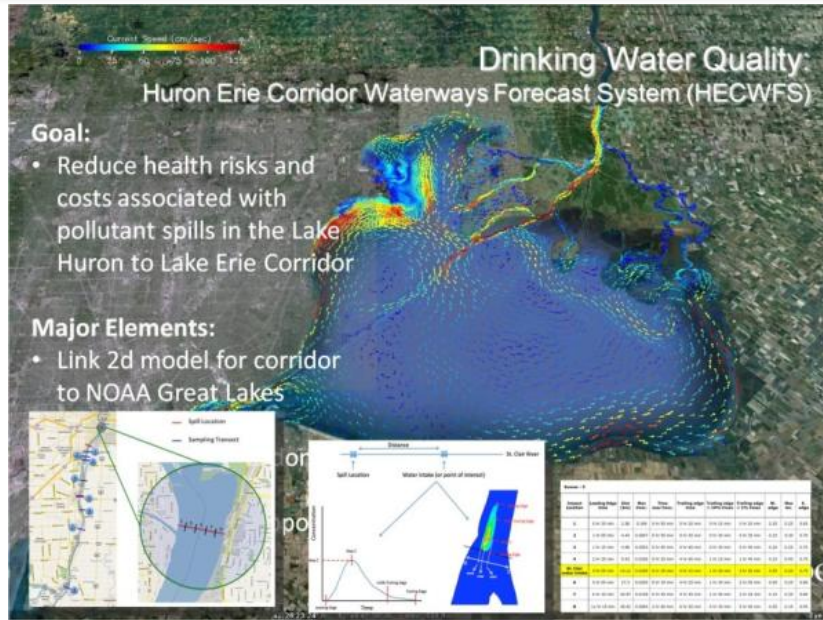
Response to Oil Spill



Deep Water Horizon

Alaska

Selected Products: Ecosystems, Fisheries & Water Quality



U.S. IOOS®: Education and Outreach



IOOS® INTEGRATED OCEAN OBSERVING SYSTEM

GLOBAL | NATIONAL | REGIONAL

Home IOOS in Action About Data Observing Systems Modeling Themes Education & Outreach

[HOME](#) | Education and Outreach

Education and Outreach

One stop location for formal and informal education, training and outreach materials that use ocean observing information about physical, chemical, geological, and biological changes in our oceans, coasts, and Great Lakes.

Education Websites Lesson Plans Using Real Data Multimedia

Regional Education Websites

Alaska Region, AOS

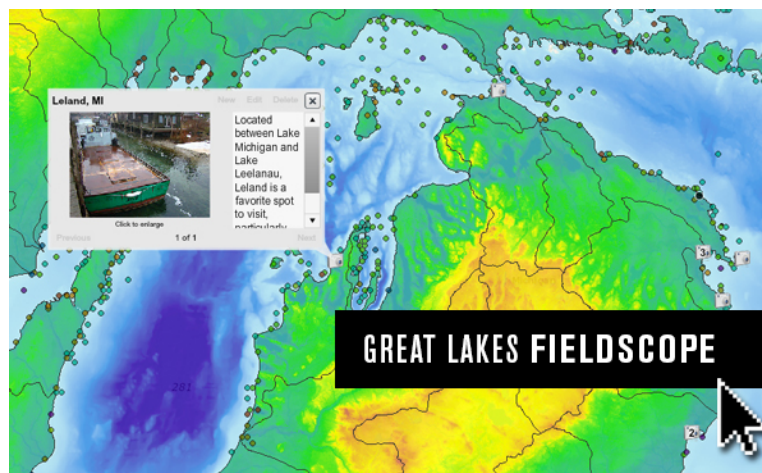
- Alaska Centers for Ocean Sciences Education Excellence: <http://www.coseealaska.net/>
- The EARTH program uses near-real-time data from ocean observatories to design and test outreach with the Internet as an interface to scientists, teachers, students, and the public: <http://www.mbari.org/earth/2011/EARTH2011.htm>
- Training for Coastal Managers, climate change, coastal communities, coastal processes, data products <http://www.aos.org/workshops-and-reports/>



Ocean Observing Education and Training

Atlantic Northeast Region, NERACOOS

- Resources ranging from teacher workshops, university programs and lectures to



Thank You

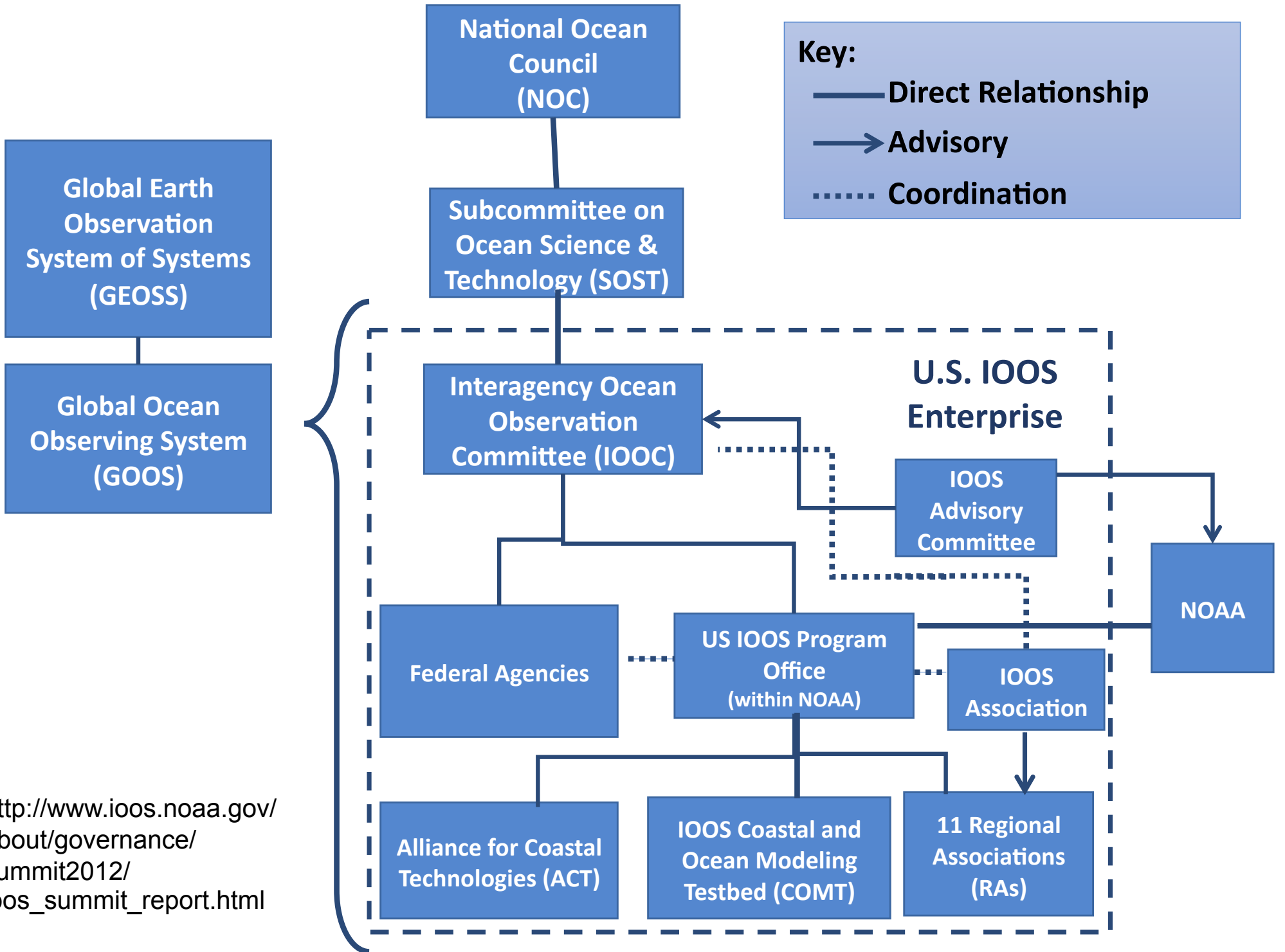
Please Visit the U.S. IOOS Website

ioos.noaa.gov

Chris.Kinkade@noaa.gov

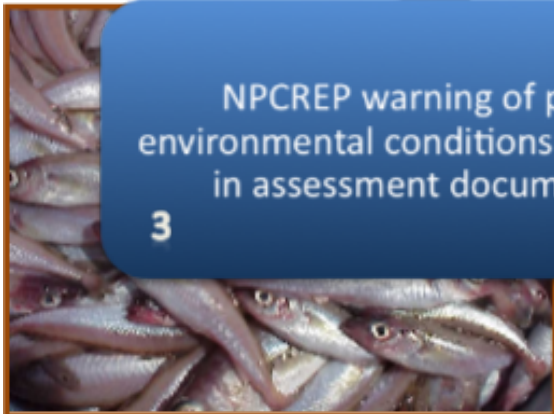


Backup Slides



http://www.ioos.noaa.gov/about/governance/summit2012/ioos_summit_report.html

North Pacific Climate Regimes and Ecosystem Productivity Program

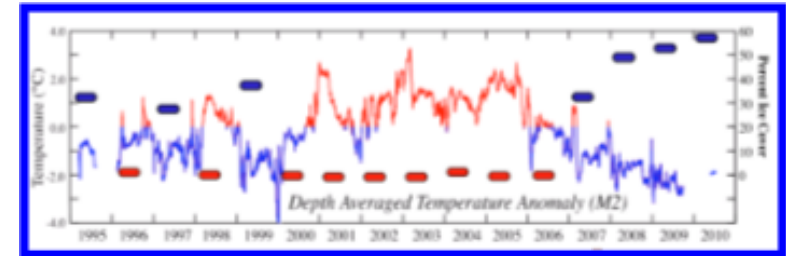


Quota cut from 1.6 to 1.3 million tons

2010 Assessment estimated significant increase in female spawning stocks for 2011, 2012



5 Council adopts SSC recommendation to reduce pollock harvest based on assessment and continuation of poor (warm) environmental conditions



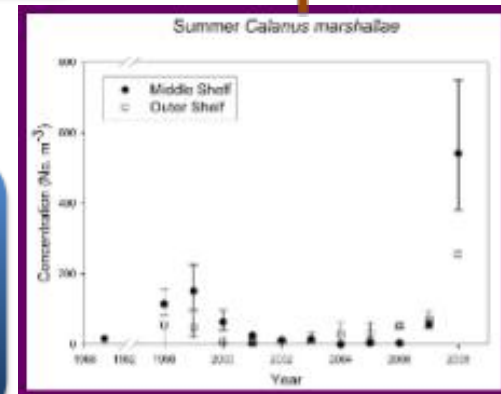
INFORMATION PATHWAY

4 Fishery Management Council's Science and Statistical Committee (SSC) receives warning

1 2005 moored temperature and zooplankton data reveal unfavorable ocean conditions for recruitment



2 Stock assessment model reveals low/declining recruitment



3 NPCREP warning of poor environmental conditions reported in assessment documents

