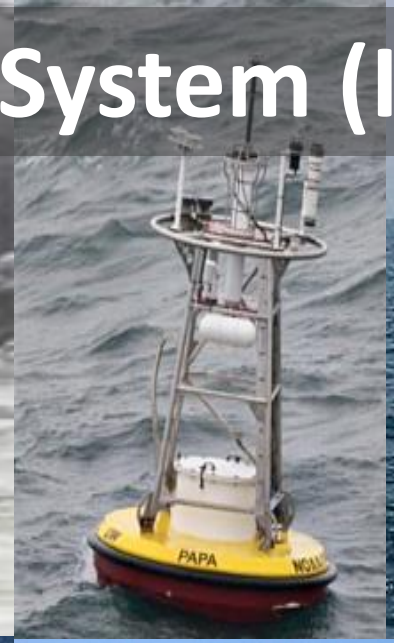
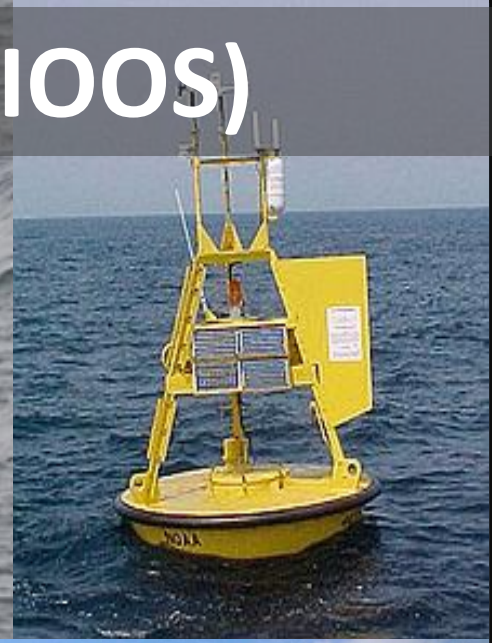
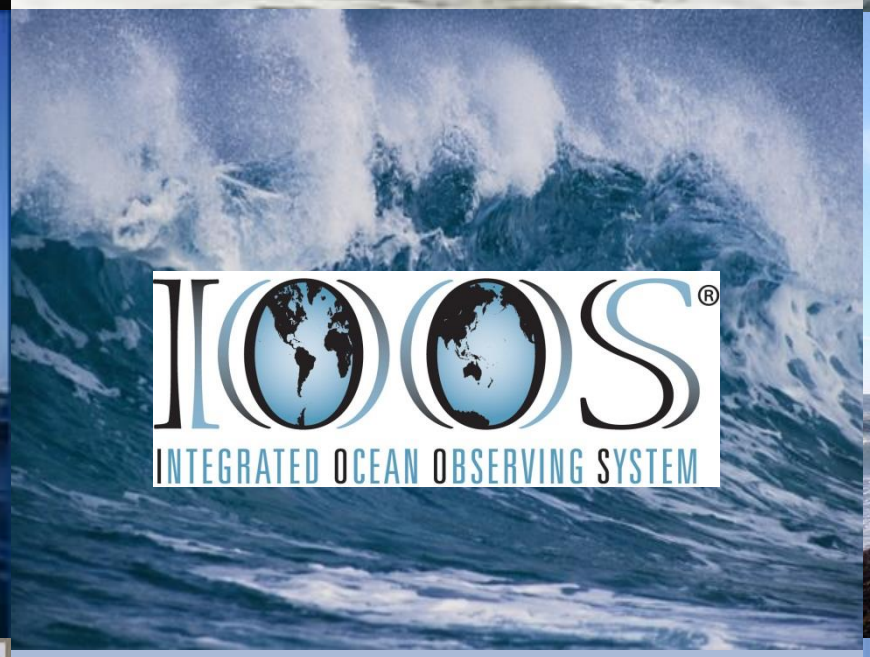
U.S. Integrated Ocean Observing System (IOOS)







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

IOOS Program in FY2013

Regional POCs
ICOOS Act Reauthorization
2013 Report to Congress
Certification
Outcome Metrics
OA
Interagency Ra
Communicatio

Post-Summit Actions
IOOS Advisory Committee
Grants Planning
Out-year Budgeting
IOOC
US GEO

SOS Reference Implementation
National Glider Network
Modeling Plan
HFR
Animal Telemetry Network
BDP Reference Implementation Plan
EPA IOOS RA Beach Water Quality
National Water Quality Monitoring
The “catalog” v3.0
QARTOD
Non-Federal Asset Inventory

IOOS Summit 2012: A New Vision for IOOS

- Summit report available online
- IOOC Meeting on 30 May was the first attempt to prioritize all summit recommendations.
- Implementation is happening now.

The Summit report is available here:
http://www.iooc.us/2013/u-s-ioos-summit-report-now-available/

Funding – FY13 Overview

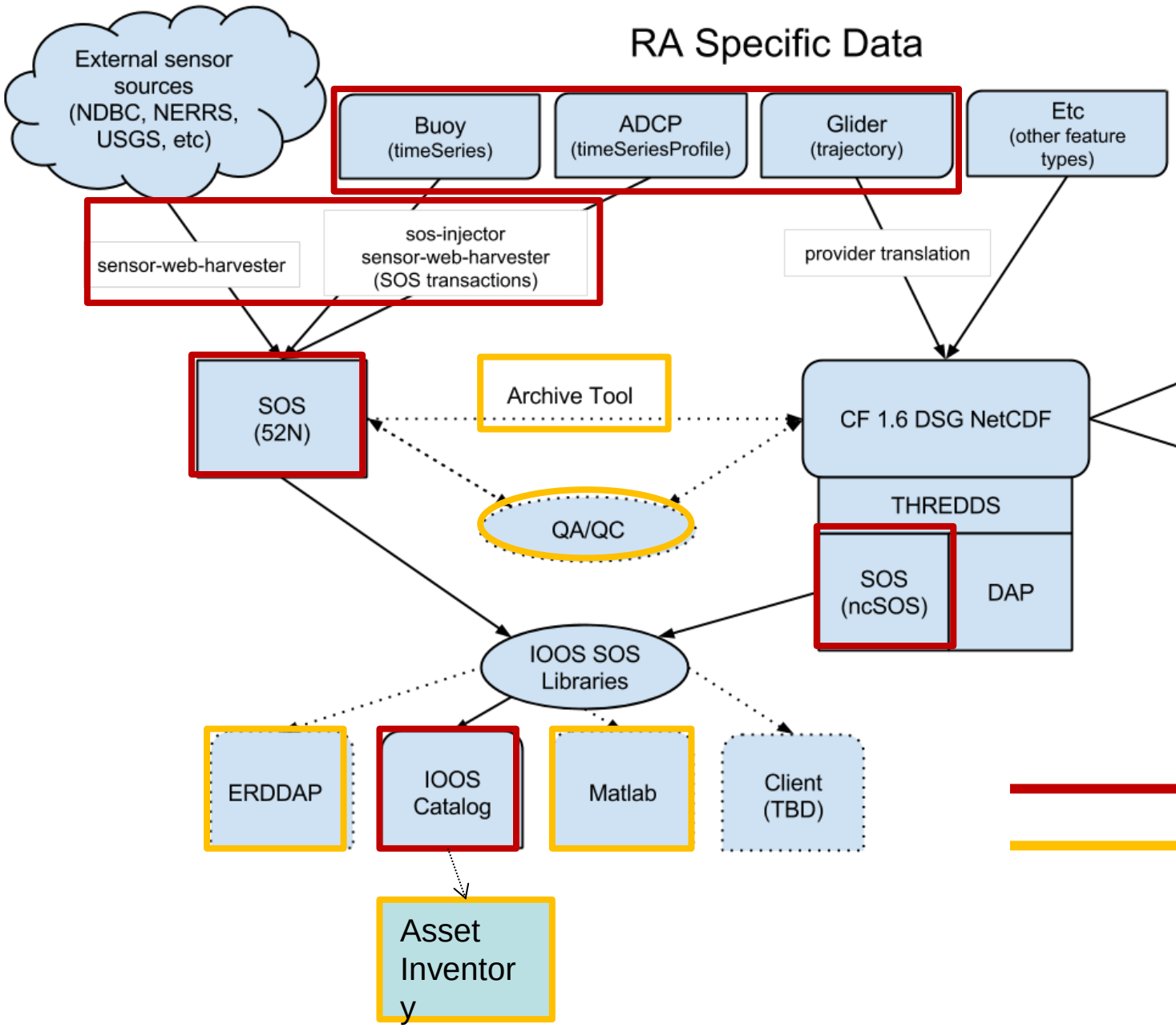
- Regional Observing Systems ($18.4M) and Surface Currents ($5M)

- FY13 Marine Sensor Innovation Project ($3.996M)
  - ➢ Alliance for Coastal Technologies (ACT)
    - Sensor Evaluation
  - ➢ U.S. IOOS Coastal Ocean Modeling Testbed (COMT)
    - Continuing efforts to advance research to operations
  - ➢ Marine sensor and other advanced observing technologies
    - Transition to Operations: Environmental Sample Processor
    - Ocean Acidification: Support for West Coast Shellfish Industry

Sandy Supplemental Awards

- Restore, replace, repair, and enhance the Regional Coastal Ocean Observing Systems
- MARACOOS and NERACOOS
- Award imminent
- First time IOOS Regions have received supplemental dollars

DMAC: on-going implementation

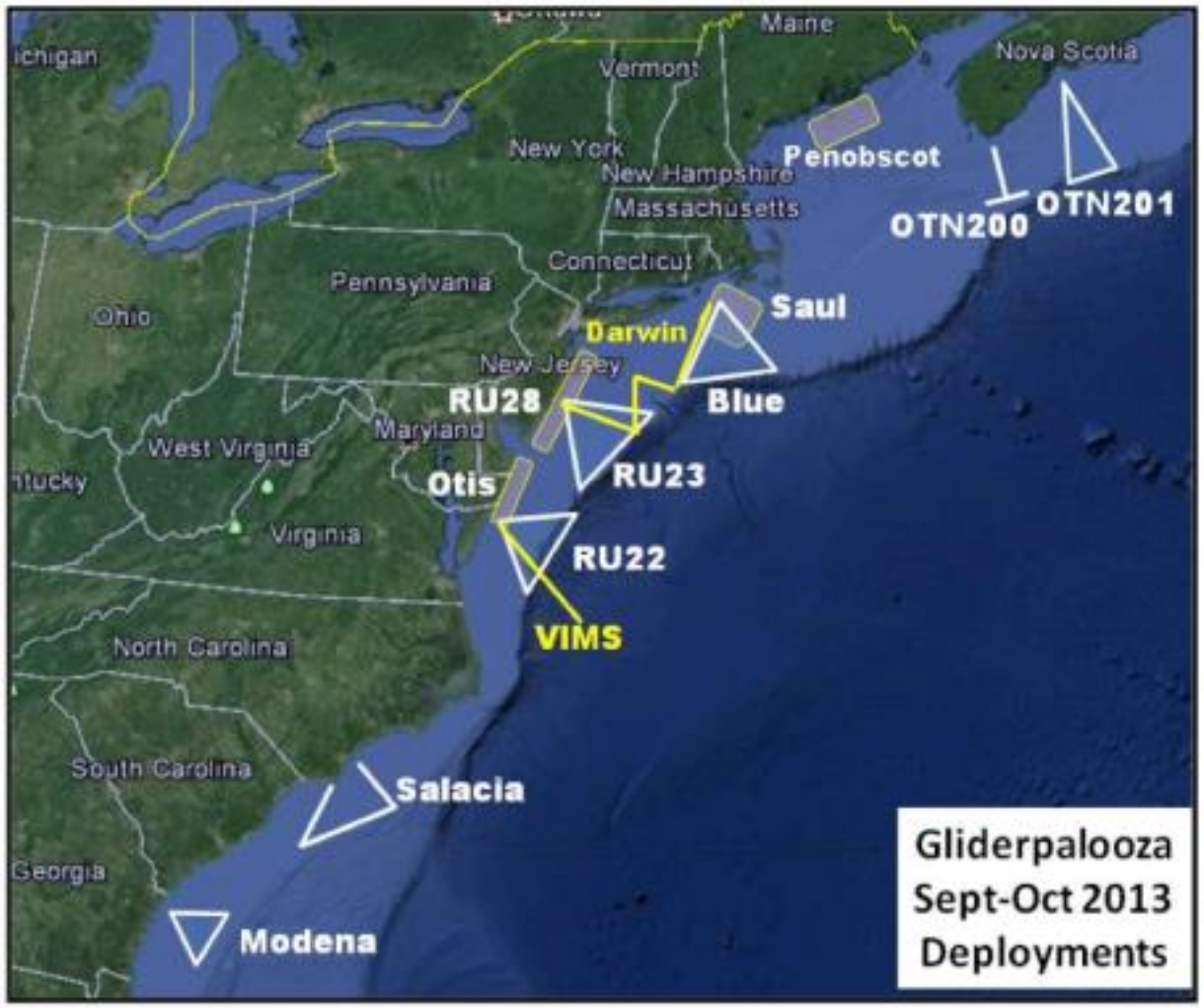


11 RA with Data Access Services; Functional and useful Catalog; Critical mass of client software

***Major Activities*:**

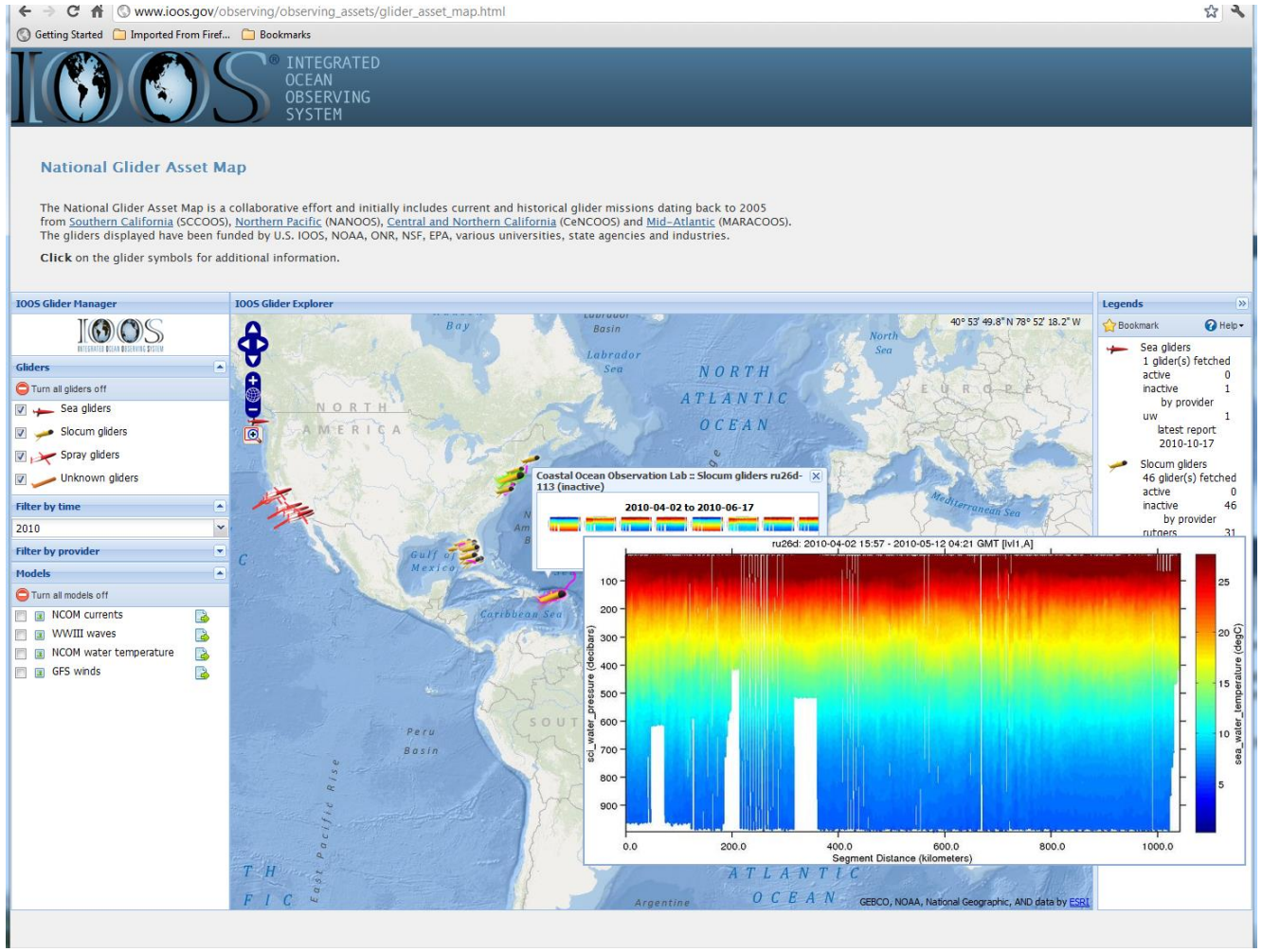
- **SOS reference implementation**
- **Centralized THREDDS data server**
- **Beta catalog (http://catalog.ioos.us)**
- **Client tools**
- **Archive utilities**
- **QA/QC software demo**

Gliderpalooza

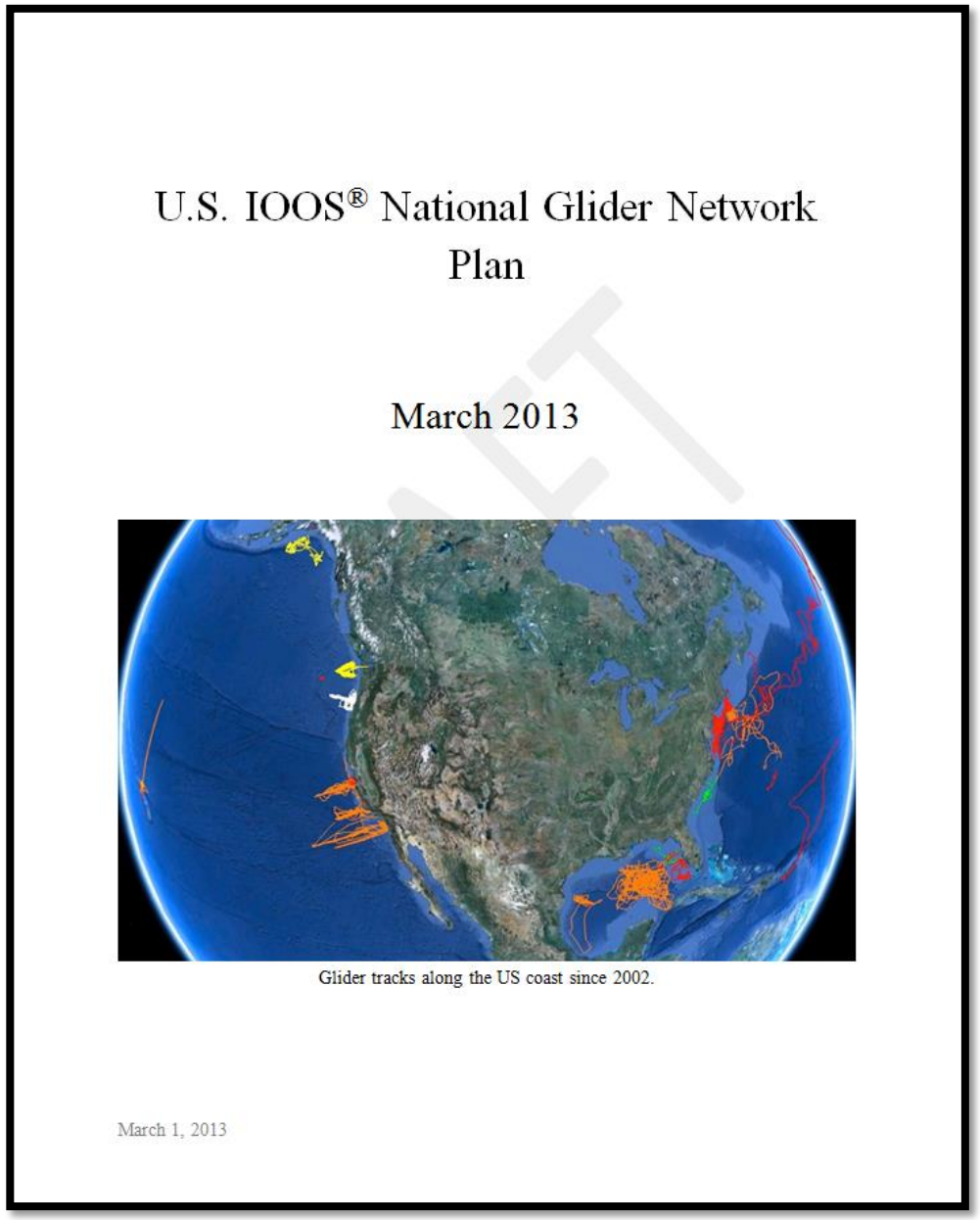


- US IOOS effort
- 15 gliders
- 15 Partners:
  - Ocean Tracking Network, Canada;
  - University of Maine; Woods Hole Oceanographic Institution, University of Massachusetts, Rutgers University, University of Delaware, University of Maryland, College of William and Mary, North Carolina State University, University of Georgia
  - Teledyne Webb Research Corporation
  - New Jersey Department of Environmental Protection
  - IOOS Northeast, Mid-Atlantic, Southeastern Regions
  - NOAA, US Navy, NASA
- >25,000 profiles to date

National Glider Network



Where are Gliders deployed today!


U.S. IOOS® National Glider Network Plan

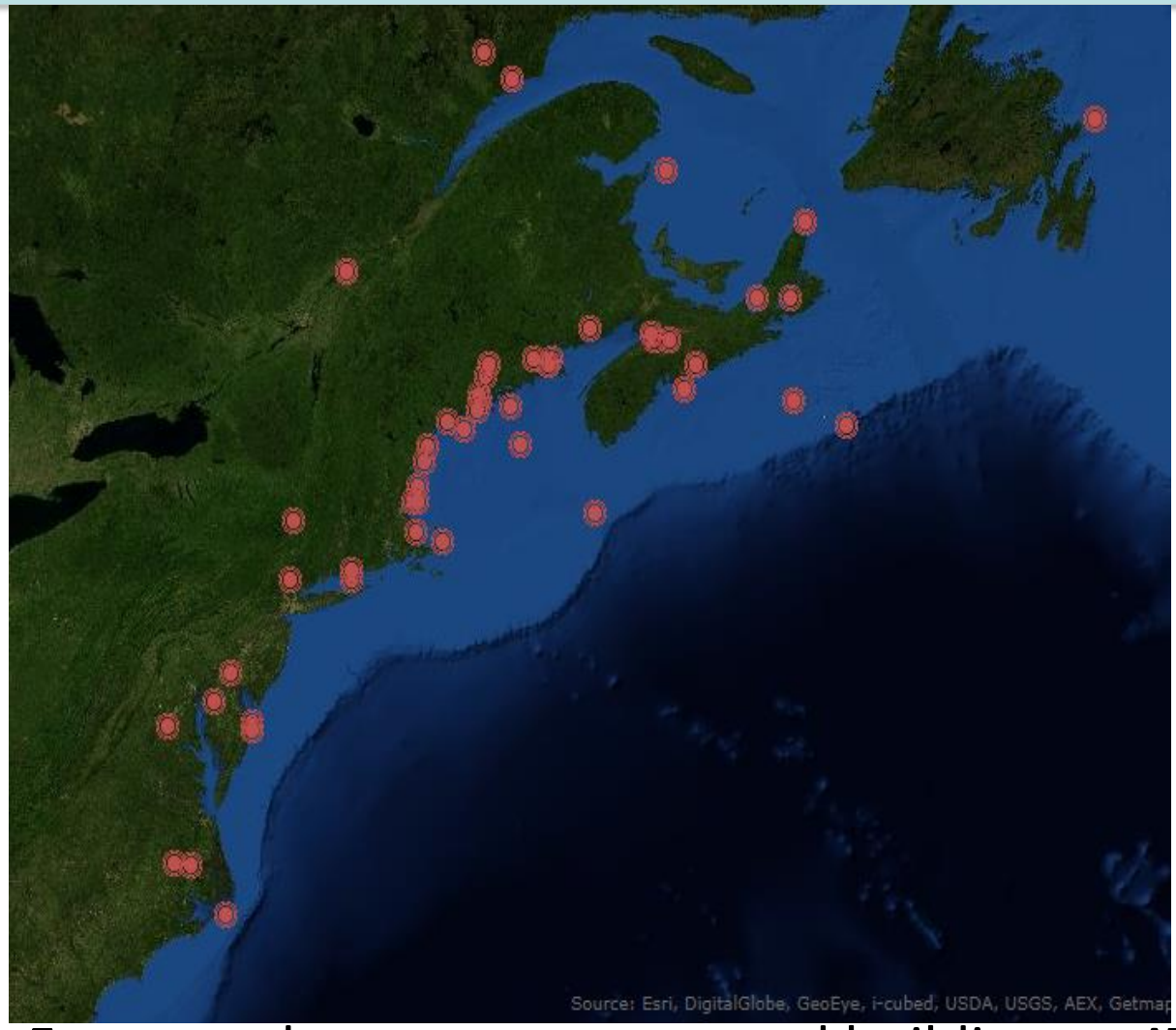
March 2013

Glider tracks along the US coast since 2002.

March 1, 2013

V2 Anticipated Soon

Animal Telemetry Network (ATN)



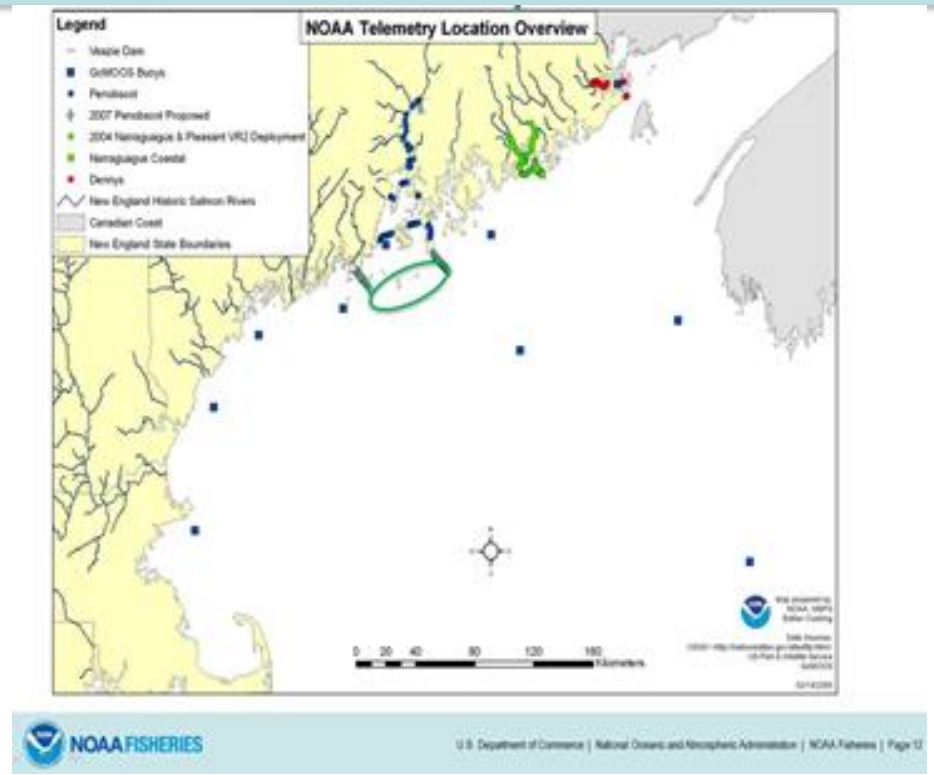


Image courtesy from John Kocik

Image courtesy from Josh Kohut

- Focus on data management and building an ATN DAC
- Reconciled Metadata Conventions for Animal Acoustic Telemetry
- Info: https://code.google.com/p/ioostech/wiki/AnimalAcousticTelData
- http://mmisw.org/orr/#http://mmisw.org/ont/ioos/animal_acoustic_telemetry
- IOOS rep on Ocean Tracking Network Council

RA Collaboration on Buoys

NERACOOS partner helped CariCOOS Refurbish Data Buoys in Record Time

- 3 buoys refurbished in record time with assistance from the University of Maine Physical Oceanography Group - May 2013
- Personnel from the University of Maine Physical Oceanography Group and CariCOOS refurbished all instruments and ground tackle and recertified the buoys for continued operation.

NOAA, IOOS, and CariCOOS Announce New Data Buoy in the Caribbean – Sept. 2013

- CariCOOS data buoy “E” was deployed on September 10, 2013 in Vieques Sound. This area is characterized by heavy recreational and commercial ferry use.
- University of Maine built buoy
- Measures wave heights, wave direction, wind speed, wind direction, air temperature, salinity, barometric pressure, and ocean currents

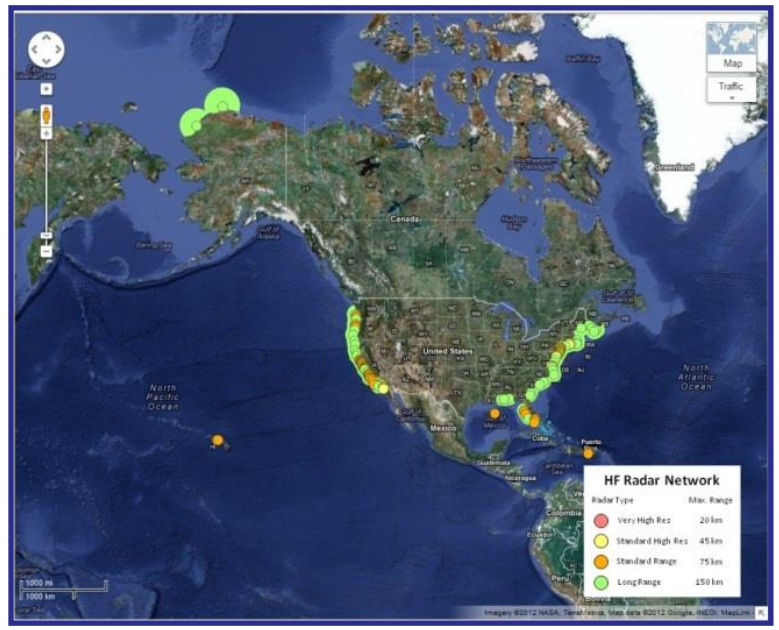
IOOS® High Frequency Radar

National Effort

- NWS
  - AWIPS Marine WFOs FY14
  - NCEP Data Tanks Q1 FY14
- NOS
  - Spill Response Ongoing
- DHS USCG
  - Search & Rescue Ongoing

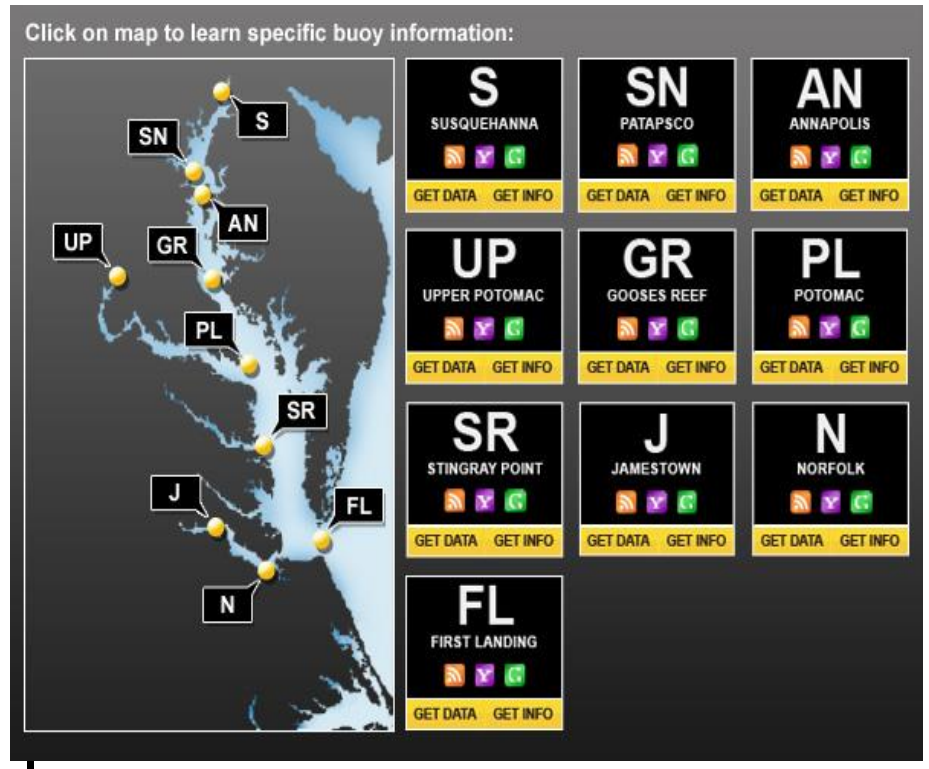
International

- GEO
  - Data & Ops Standards
  - Data Sharing



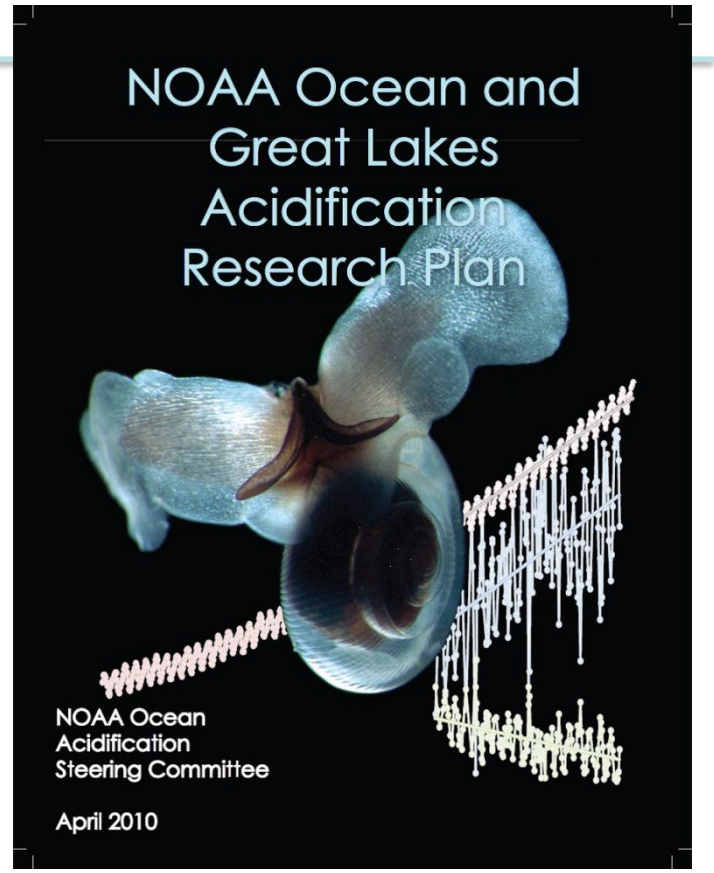
CBIBS – A New Partnership

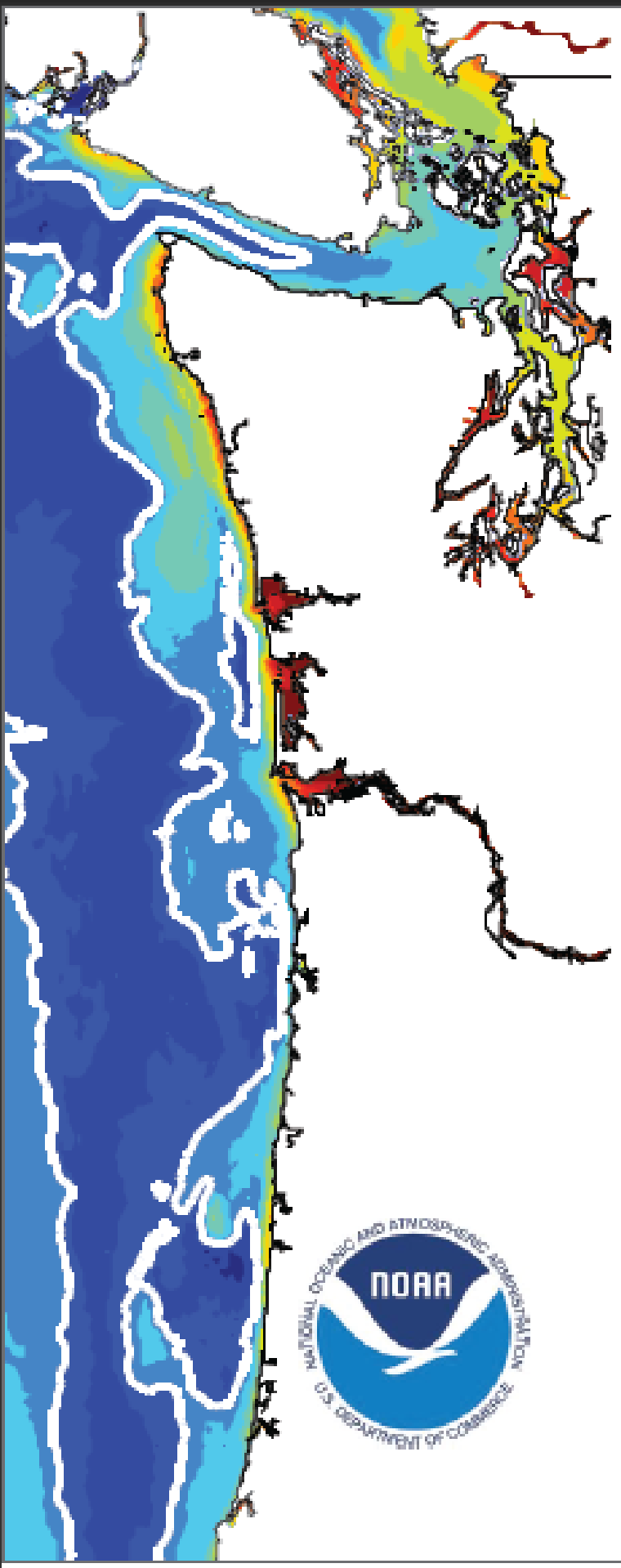
- Joint operation and maintenance of the Chesapeake Bay Interpretive Buoy System
- New funding in FY13 and beyond from the NOAA Chesapeake Bay Office
- Partnering on:
  - On-the-water operations
  - Research and development activities to expand and enhance the system
  - Data quality assurance and control
  - Web services to improve CBIBS data dissemination and integration into regional networks



Ocean Acidification

- IOOS and NOAA's OA Program (OAP) are collaborating to build a national system of OA observations for the oceans, coasts, and estuaries
- RAs help OAP understand stakeholder needs, provide observing platforms and infrastructure, assist with data management, and lead education and outreach efforts
- OAP supports with funding to four RAs to date; IOOS marine sensor funds support additional RAs
- Partnership with NOAA OA Program (OAP) expanding each year
- FY14 call for marine sensor and advanced technology proposals includes an OA topic area
- NECAN is emerging through the hard work of NERACOOS and partners in this region
- March 2014 workshop in Chesapeake Bay – "Towards an OA Research and Monitoring Strategy"





J-SCOPE is a FATE (Fisheries And The Environment) project, funded by NOAA and presented by NANOOS

JISAO's Seasonal Coastal Ocean Prediction of the Ecosystem (J-SCOPE) 2013 Forecast

UNIVERSITY of WASHINGTON

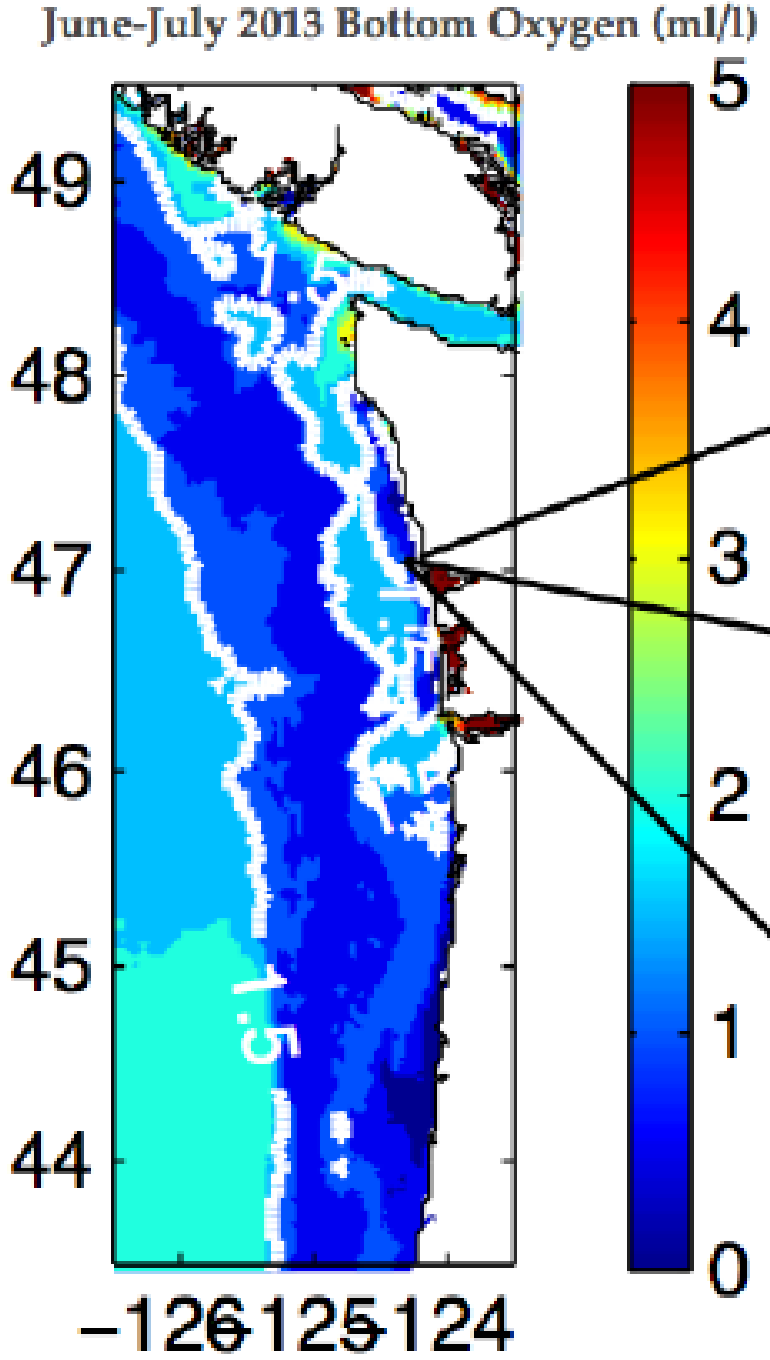
JISAO

NOAA

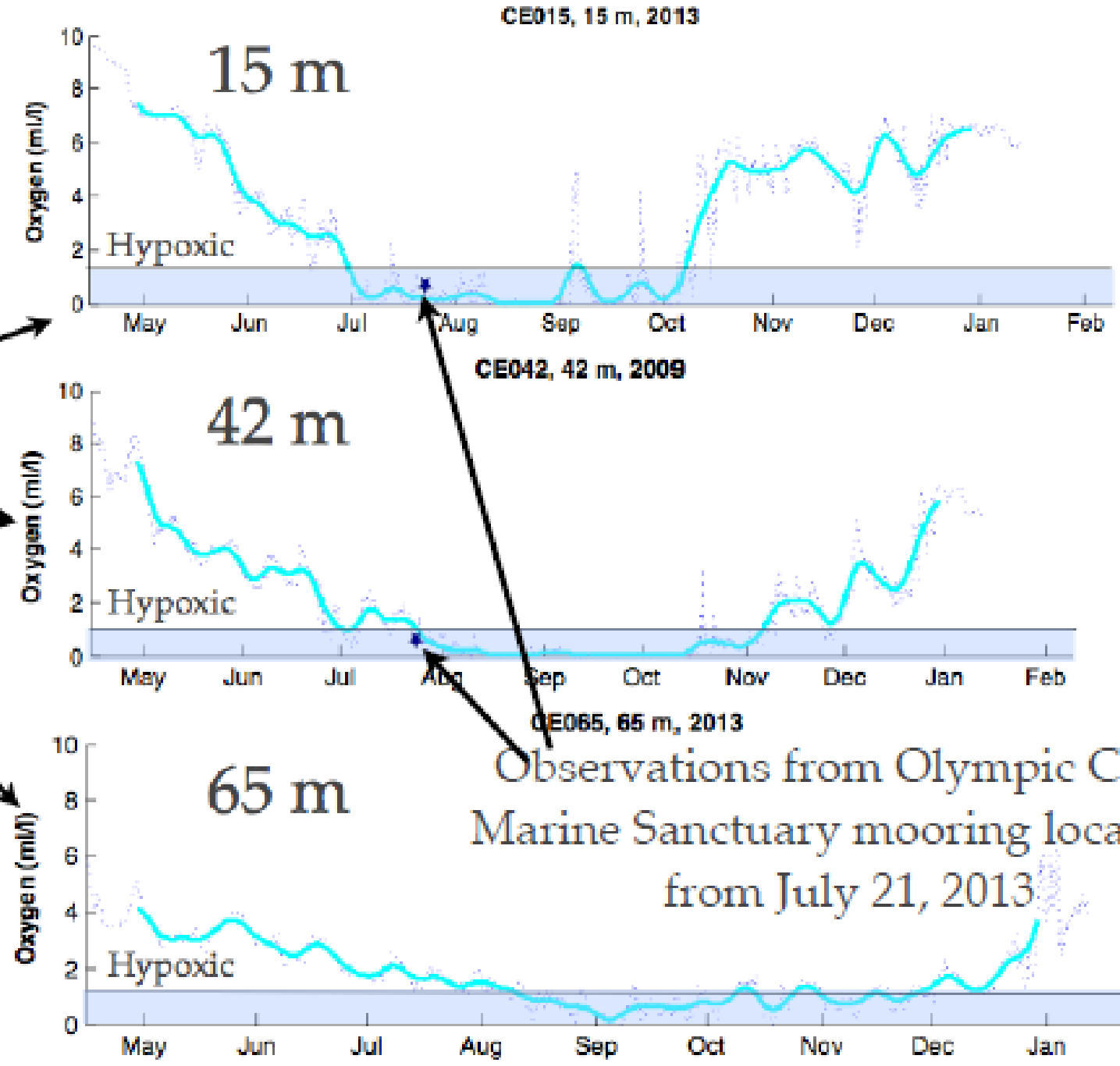
UW Coastal Modeling Group

NWFSC NORTHWEST FISHERIES SCIENCE CENTER

NANOOS



White contour outlines Hypoxic Zones (<1.5 ml/l)



Forecast: Hypoxia begins in July, 2013 for Cape Elizabeth region of WA coast

J-SCOPE

Oxygen model - Siedlecki et al, in prep

Where can I find the J-SCOPE forecast?

Updated quarterly

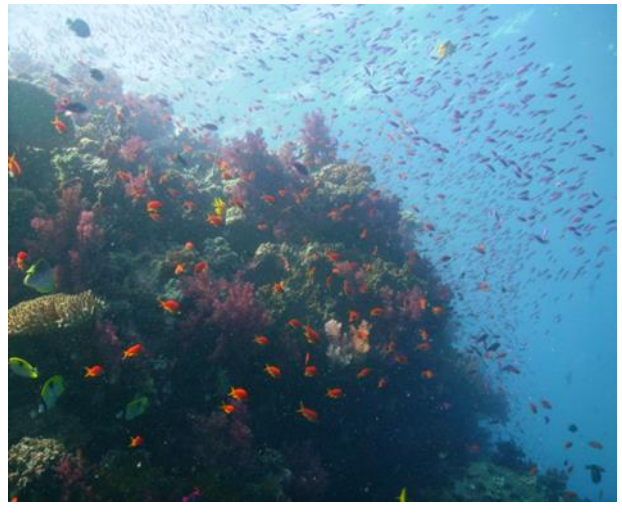
Check out our website:

http://www.nanoos.org/products/j-scope/home.php

U.S. Marine Biodiversity Observation Network

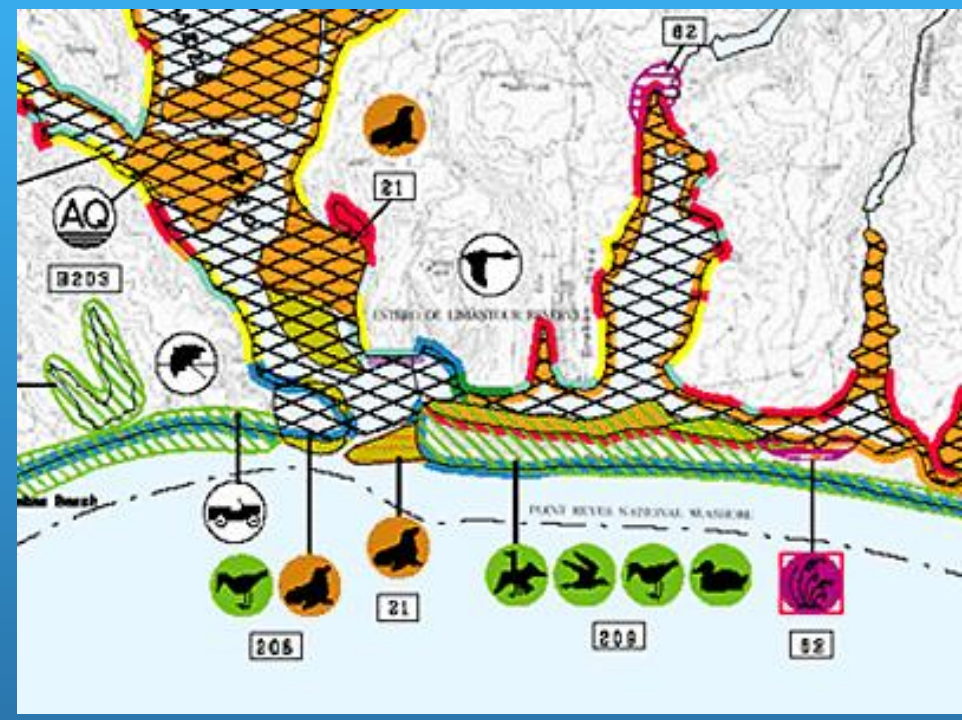
- IOOS leading development of this interagency effort
- Funding will come from across NOAA, NASA, USGS, BOEM, and likely other agencies
- Proposals received and under review
- Applicants are encouraged to coordinate with the appropriate RAs, among others
- Calling for demonstration projects that:

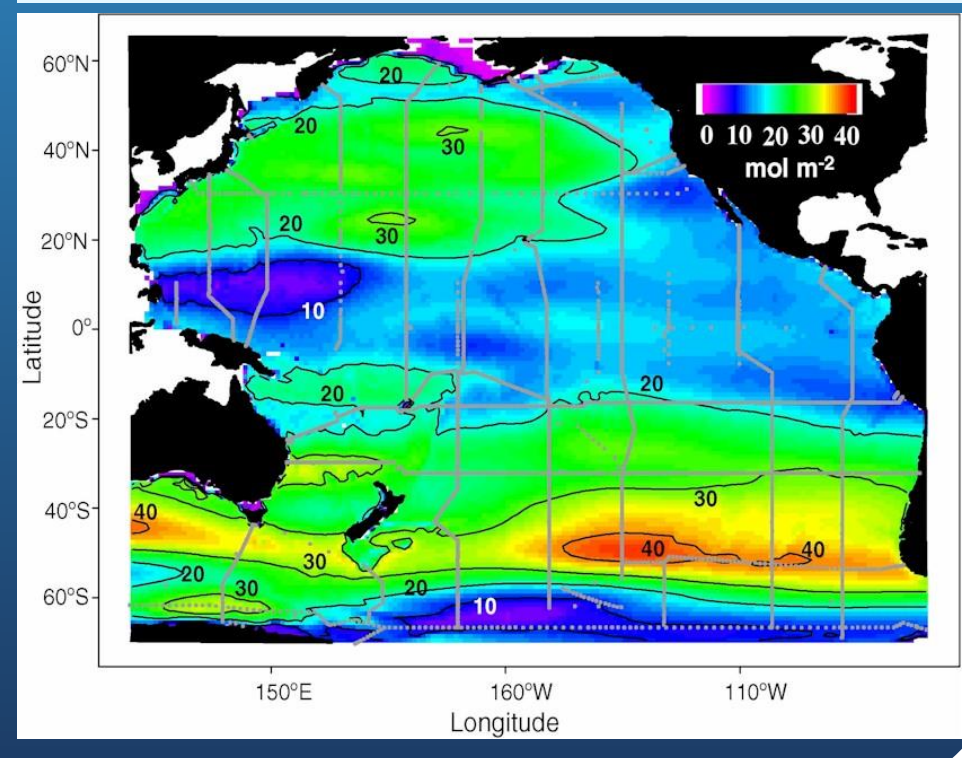
1. Integrate existing monitoring and data collection programs and methodologies with new approaches,
2. Include multiple scales (time, space, species, etc.),
3. Address sampling needs (automated processing, species identification, informatics), and
4. Meet community data management requirements and make data widely accessible.



NOAA's Ecological Forecasting Roadmap

- There is substantial customer demand for ecological forecast products
- NOAA lacks a coordinated approach to development and delivery of ecological forecast products and services
- NOAA can better use its observational and computational capabilities
- **New Roadmap**
  - NOAA-wide capability
  - Effective and efficient
  - Establish priorities and collaborations
  - Build-on existing infrastructure and partnerships
  - Improve quality and delivery of products and services





Sustainable Planning – So What?

Peruvian Anchovy

Photo credit: WWF

Photo credit: Hightower report

Fishmeal

Photo credit: PT SUMBER YALA SAMUDRA

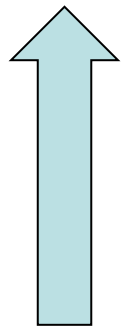
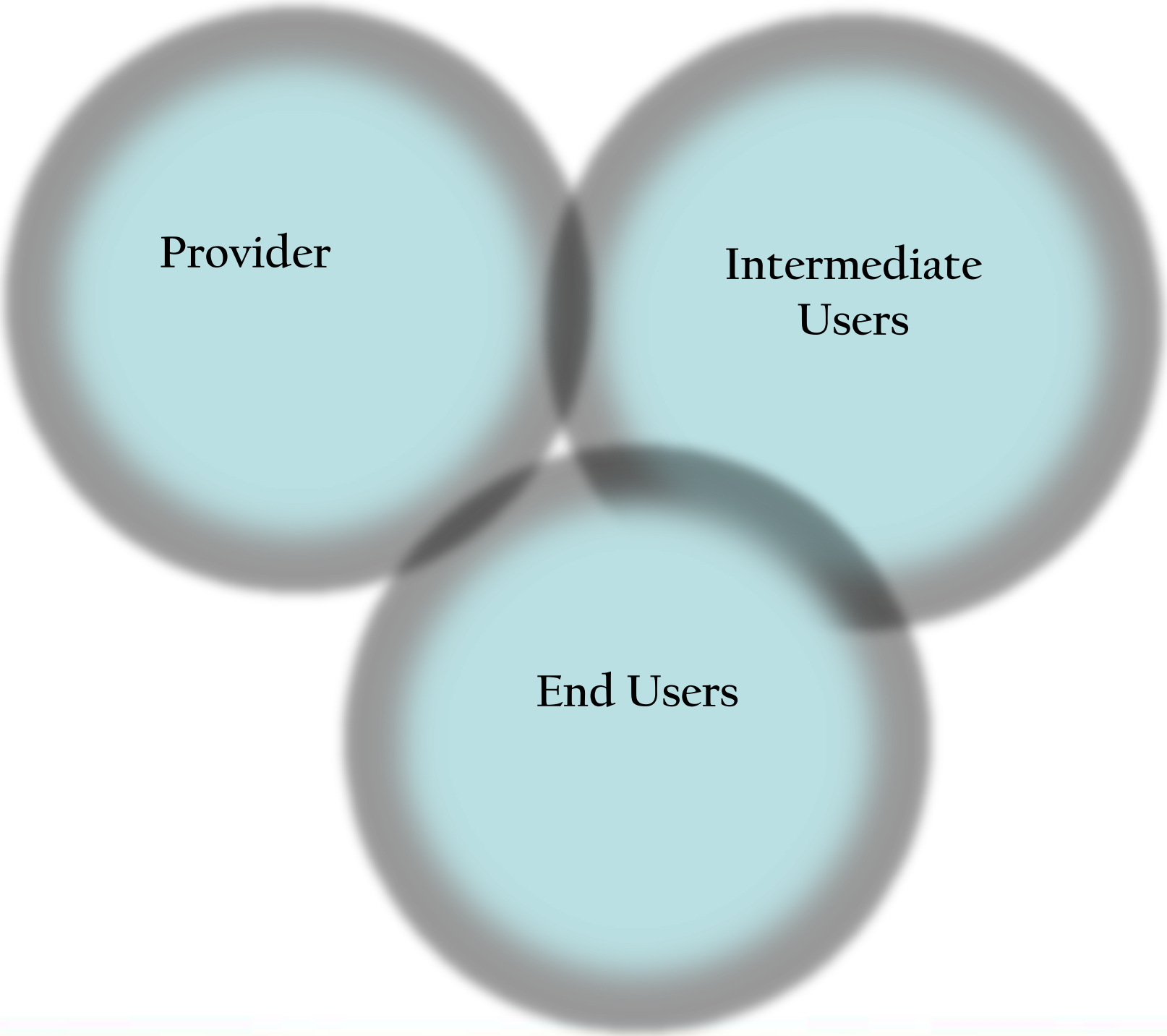


Photo credit: Clemson University

Story credit: BNY Mellon

Industry Study Framework



Credit: Rayner – IOOS Summit 2012 – white paper

Other Studies

Society of Maritime Industries

Annual Review of UK Marine Scientific Industries 2012

Key Findings

- Commercial Marine Science and Technology more than doubled since 2010
- Market confidence is high: 81% forecast growth in the market
- Small to Medium companies dominate the sector
- Skill shortages present a barrier to future performance in MST
- Offshore oil/gas largest sector; but renewable energy saw growth

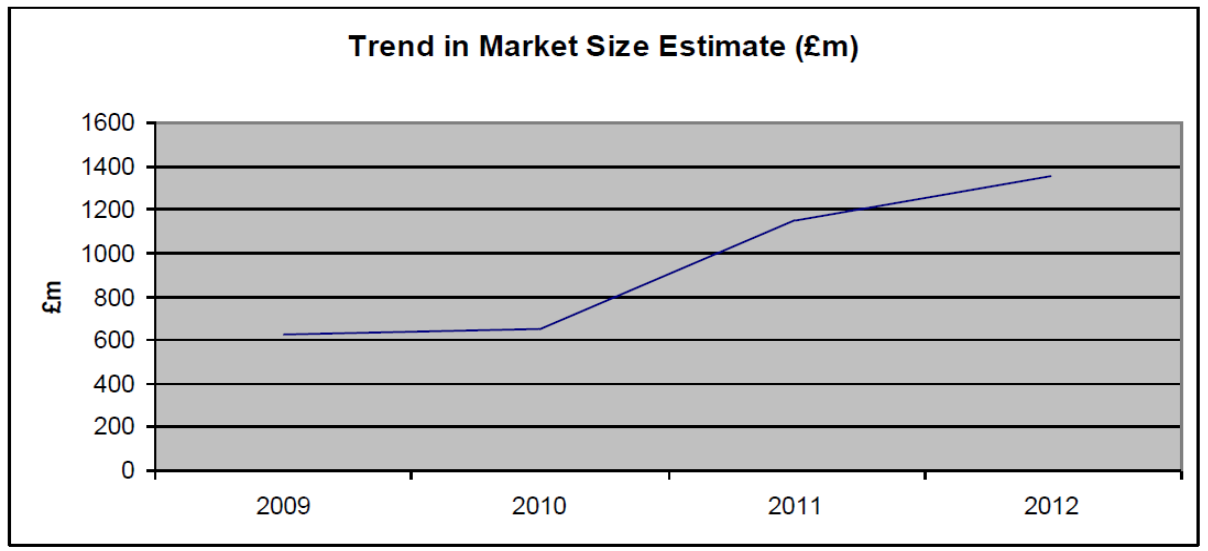
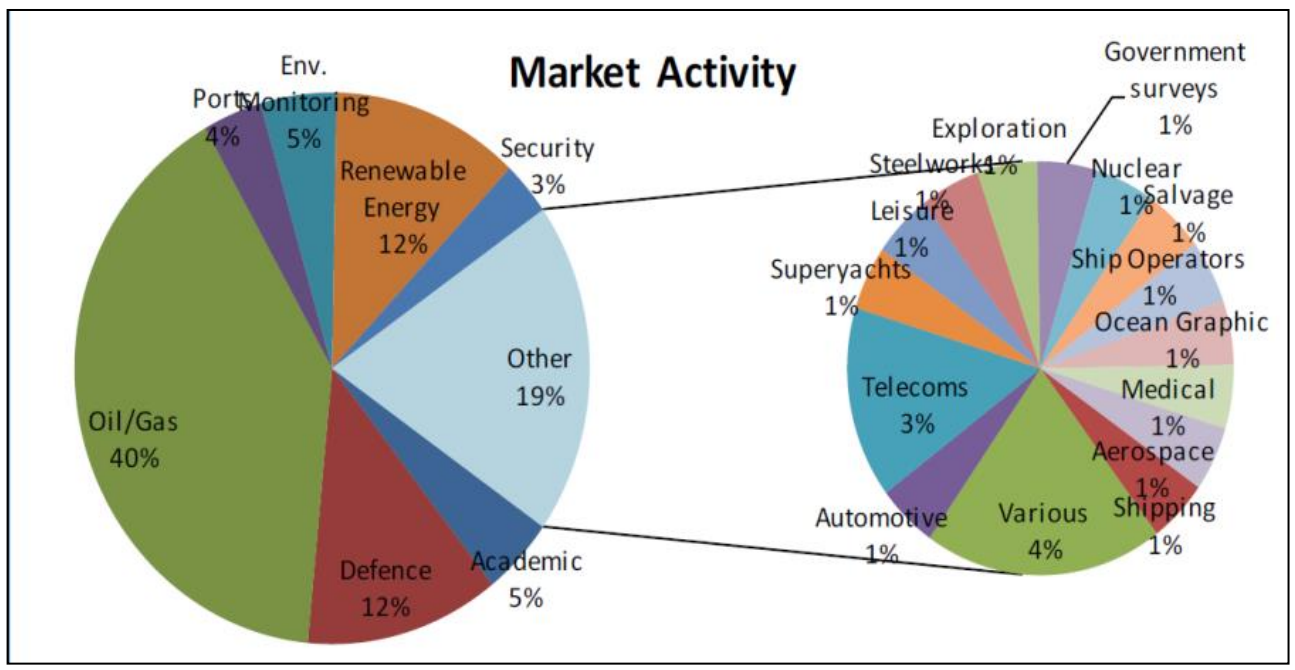
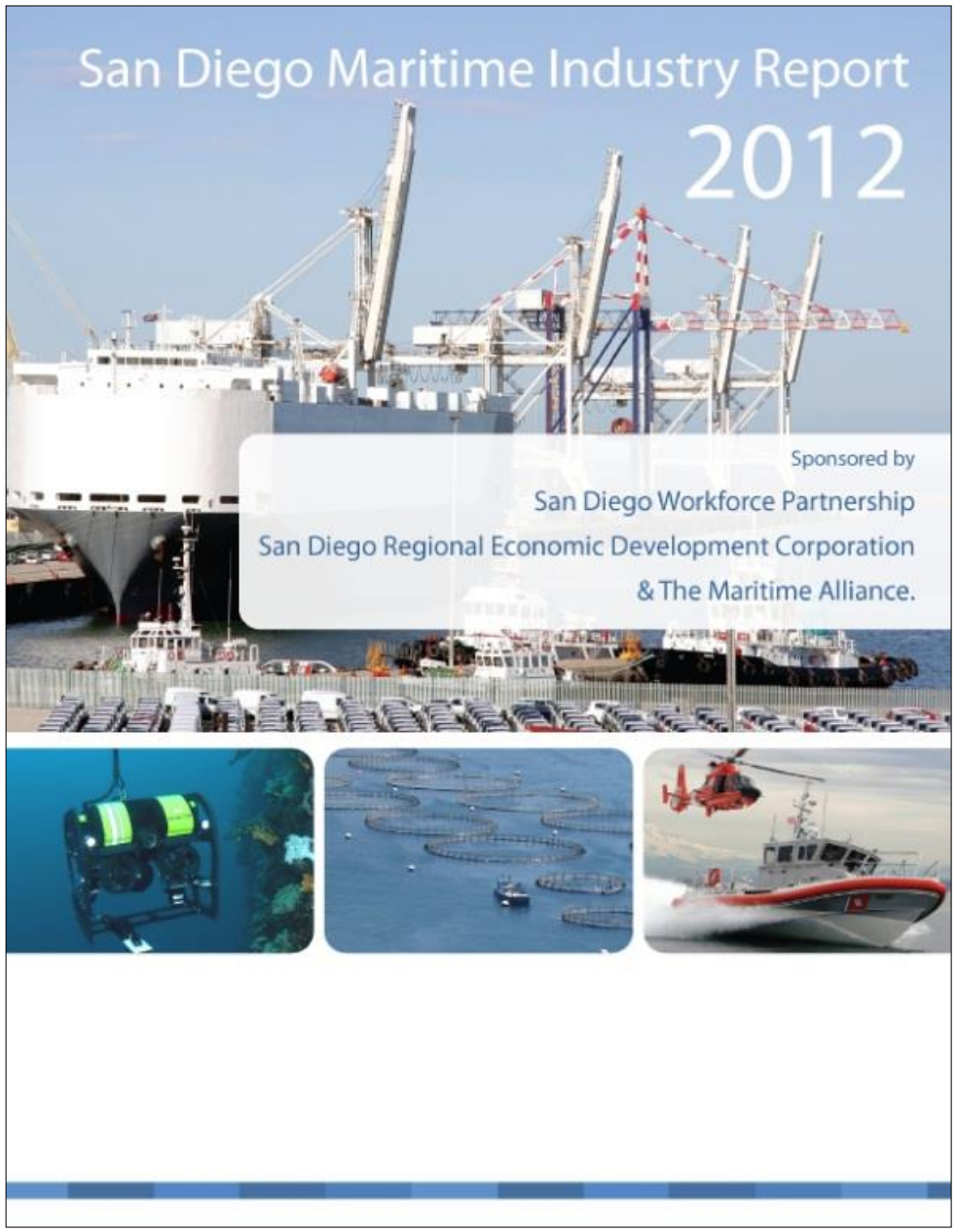


Fig. 1 MST Market size over the past 4 years.



San Diego Study



Overall Findings

- Total employment: 46,000 jobs
- Total Revenues: $14 billion (2011)

San Diego Blue Tech Findings

- Highly differentiated industry – 14 sectors in San Diego; 71 sub-sectors
- Prevalence of multi-use technologies from small, specialized firms
- Largely invisible in local markets / limited public & government awareness
- **Little baseline economic data due to non-specific NAICS codes**
- Highly export-oriented – typically 40-60 percent
- Markets exist in virtually every country around the world
- Growth in most sectors strongly outpaces world economic growth

Marine Technology and Services Industry Study

- Marine technology industry is an important partner and stakeholder
- First step toward assessing the economic impact of the marine ocean technology sector in the U.S.
- Collection and analysis of both qualitative (interviews) & quantitative data (survey).

Welcome to the US IOOS® Impact Study of the Marine Technology Sector

ANY PROVIDE TECHNOLOGY TO THE US IOOS OR HAVE A PRODUCT THAT
DATA? WE WOULD LIKE TO HEAR FROM YOU.

d Ocean Observing System (IOOS, www.ioos.gov) has awarded ERISS
nds to work with The Maritime Alliance on a study that will articulate the
f the ocean observation sector in the U.S. This nationally-focused study will
es classified as providers of technology to US IOOS and intermediate users of US
hat sell it to end users. The study will address items such as: number of
category (provider and intermediate user), size of these companies, volume of
exports, and number of employees. The study will include narratives by
US IOOS has helped their operations, planning, and growth, as well as perceived
growth and investment. The study began September 2013.

rised of 17 federal agencies, 11 regional associations (RAs), and a technology
lidation organization (the Alliance for Coastal Technologies (ACT). Additional
large and growing number of organizations including industry, academia, state,
vernments, and other federal and non-federal organizations.

s about your experiences with the IOOS or to opt in to the study.

Your participation is critical in order to assess the impact of this valuable system.

For further information on this study, please contact The Maritime Alliance Executive Director Bill Riedy at briedy@TheMaritimeAlliance.org / (619) 450-4600 x182 or the President Michael Jones at mbjones@TheMaritimeAlliance.org / x142.

http://www.usworks.com/usioos/

Growing Together

OCEAN SENSORS
The Leaders in HF Radar Technology

CODAR

- 1984: Barrick and staff leave NOAA to form CODAR company to commercialize HF radar
- 1986: CODAR Ocean Sensors, Ltd. officially founded.
- 1983-88: first-generation CODARs; deployed North Sea offshore oil rigs.
- 1992: Second-generation CODARs
- 2002: 100th SeaSonde sold
- 2009: Rapid overseas growth
- Today: 98% IOOS network; deployed in 30 countries
- Broken sales records last 3 years

IOOS

- 2002: CA Prop 40 & 50 - $21 million is designated for the “Coastal Ocean Circulation Monitoring Program” (COCMP)
- 2004: IOOS project based < 15 radars
- 2005-2006: Network emerges
- 2008: Network reached 100
- 2009: National Surface Currents Plan V1
- 2012: O&M dollars in budget
- Today: > 130 Radars
- Global through Group on Earth Observations (GEO)

IOOS – Hot off the Presses!

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Coast Guard Adopts a High-Frequency Solution

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Sept. 9, 2013

Contact: Keeley Belva, 301-713-3066
Jennie Lyons, 301-427-2446

NOAA, government and academia partners deploy underwater robots to improve hurricane science
'Gliders' collect ocean data off East Coast

A fleet of underwater robots is descending into waters off the east coast to collect data that ecasts during future hurricane seasons. Several regions of Observing System (IOOS®) are partnering to deploy 12 to hicles, also known as *gliders*, from Nova Scotia to

marine technology SOCIETY Journal
The International, Interdisciplinary Society Devoted to Ocean and Marine Engineering, Science, and Policy
Volume 47 Number 5 September/October 2013

U.S. Integrated Ocean Observing System
(U.S. IOOS)
2013 Report to Congress

marine scientist
No. 43 May 2013

INTEGRATED OCEAN OBSERVING SYSTEM

IOOS – enabling decision-making and scientific advances

In the previous edition of *Marine Scientist* we briefly introduced the US Integrated Ocean Observing System (IOOS®). It comprises more than a dozen national agencies and institutions led by the National Oceanic and Atmospheric Administration (NOAA), along with a regional component that is strategically positioned to serve the US and the broader international oceans, coastal and estuarine communities. IOOS supports the United States' National Ocean Policy, which ties America's stewardship of the ocean, coasts and the Great Lakes to prosperity and security. IOOS is the US contribution to the Global Ocean Observing System (GOOS) – the ocean component of the Global Earth Observation System of Systems (GEOSS).

Zdenka Willis, Director, US IOOS Program Office and **Dr Richard Spinrad**, Vice President for Research, Oregon State University, write about the impact and benefits of an Integrated Ocean Observing System

IOOS and GOOS

Measuring Phytoplankton

Publications

COMMENTARY

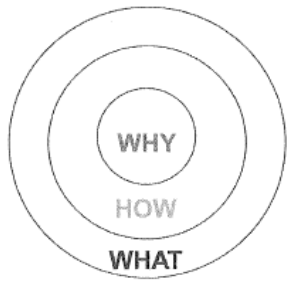
U.S. IOOS: An Integrating Force for Good

AUTHORS
Zdenka Willis
Laura Griesbauer
U.S. Integrated Ocean Observing System Program Office, National Oceanic and Atmospheric Administration

Whether you realize it or not, you rely on ocean and coastal observations everyday. With federal, regional, and private sector partnerships, the U.S. Integrated Ocean Observing System (IOOS®) is one of our nation's best kept secrets to achieving a 1 + 1 = 3 (or more) result. In these tough economic times, this commentary is about U.S. IOOS and believing that this concept is still worth pursuing.

In a talk on how great leaders inspire action, famed author and expert Simon Sinek (http://www.ted.com/ helping us gain momentum? Perhaps it is because we share a passion for what we do and that we have a deep understanding of the "Why." We made an attempt at applying Sinek's Golden Circle to IOOS in Figure 2.

FIGURE 1
Simon Sinek's Golden Circle.



We put forward the "Why" of IOOS because it enables decisions everyday, fosters advances in science and technology, and improves the marine economic and ecological health of our nation. To prove our hypothesis, we offer the following examples to demonstrate the Why, How, and What of IOOS.

The first example is a tale of two storms—Hurricanes Irene (August 2011) and Sandy (October 2012). This example covers a breadth of IOOS capabilities. U.S. IOOS observations and forecasts supported the National Oceanic and Atmospheric Administration's (NOAA) hurricane and storm surge forecasts. Technology used in new ways showed potential to improve hurricane intensity forecasting, and through the U.S. IOOS partnership of people, the new use of

U.S. IOOS Program
March 2013

IOOS INTEGRATED OCEAN OBSERVING SYSTEM

Thank You

Please Visit the U.S. IOOS Website

ioos.noaa.gov