U.S. IOOS® Assessment Results

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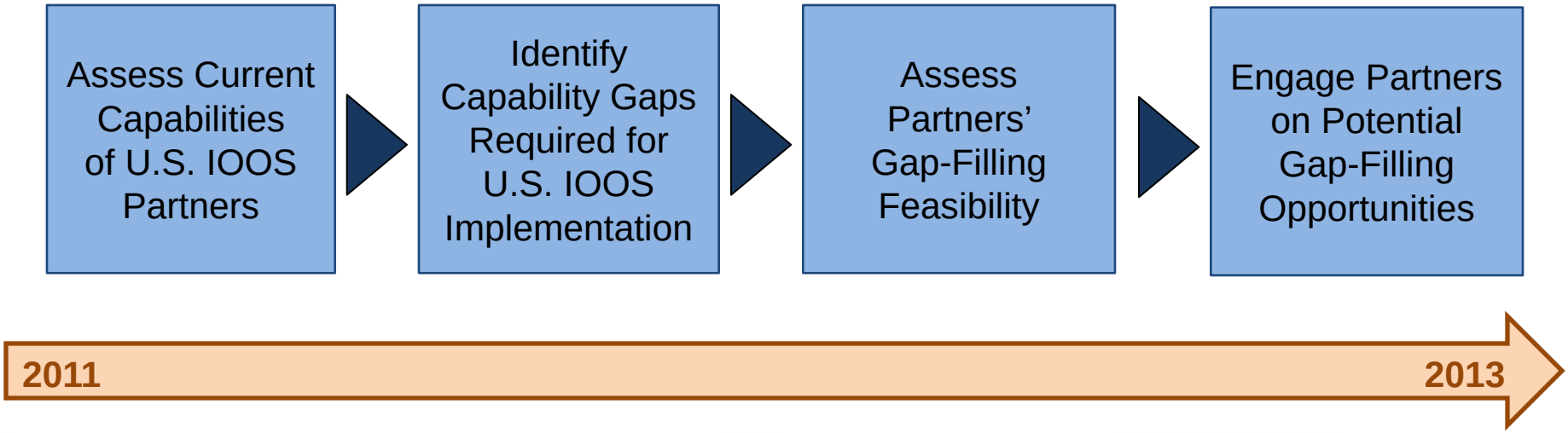
Agenda

- U.S. IOOS Assessment Purpose
- U.S. IOOS Assessment Scope
- U.S. IOOS Assessment Results

U.S. IOOS Assessment Purpose

- Identify current and potential Federal and Regional contributions to U.S. IOOS to meet customer needs (via the U.S. IOOS Assessment)
- Document partner contributions in the context of the U.S. IOOS requirements described in the U.S. IOOS Blueprint (*i.e.*, Core Functional Activities within 6 IOOS subsystems)
- Address partner collaboration opportunities to fill selected gaps identified in the Assessment via partner engagement
- Use resulting capabilities and gaps to inform U.S. IOOS implementation planning



U.S. IOOS Assessment Scope

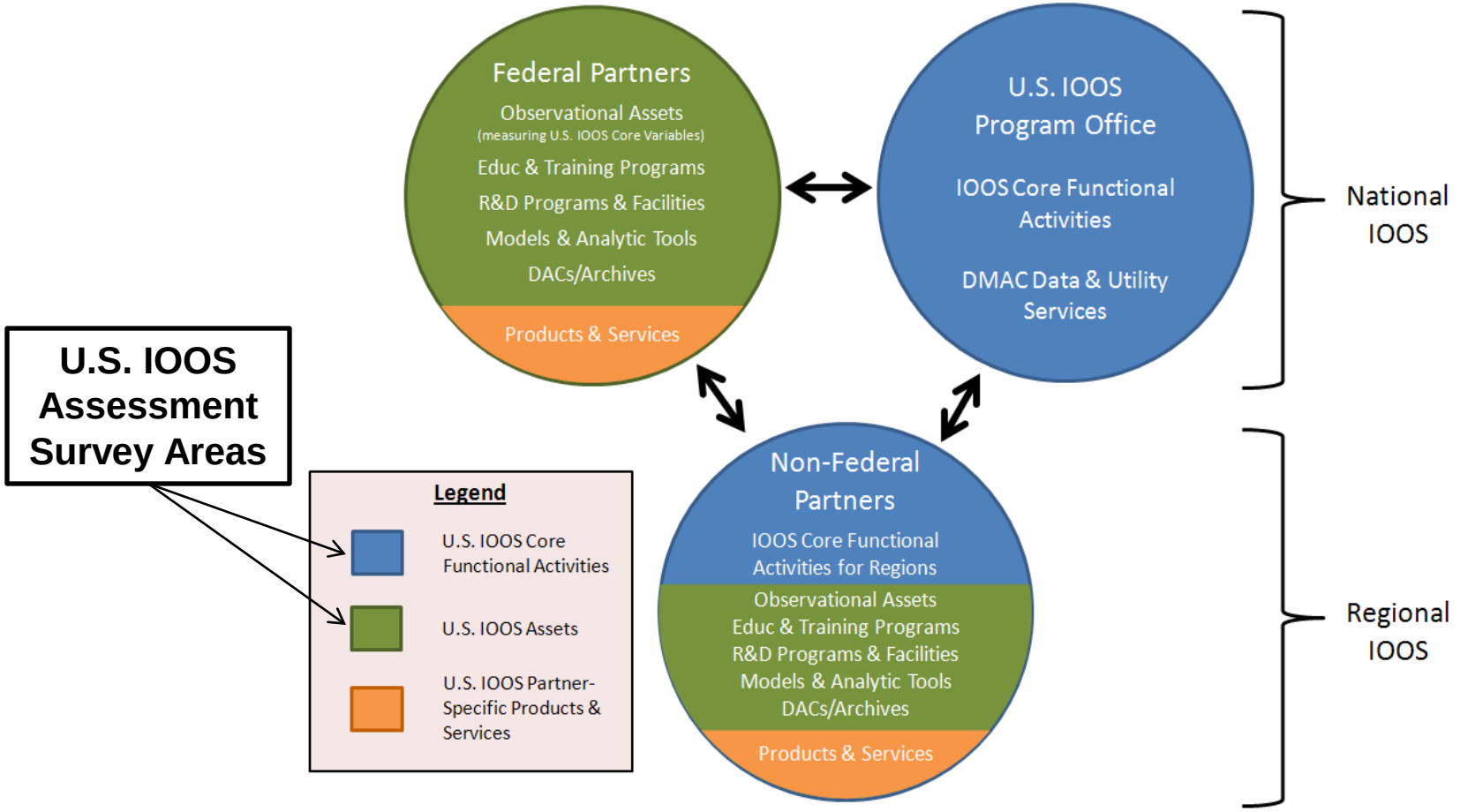
- The U.S. IOOS Assessment surveyed two types of information:
  - 4 categories of U.S. IOOS assets:
    - Observing assets
    - DMAC assets
    - R&D assets
    - Training & Education assets
  - 37 U.S. IOOS core functional activities (CFAs) for developing and operating the System
    - CFAs describe U.S. IOOS Program coordination and management products and services
    - CFAs are derived from stated or implied requirements in:
      - ICOOS Act of 2009
      - Interagency Working Group on Ocean Observations (IWGOO) Strategic Plan (2008)
      - First U.S. IOOS Development Plan (2006)

U.S. IOOS Scope – Partners and Variables

- A U.S. IOOS partner is defined as any entity that assists the U.S. IOOS Program with carrying out its mission and that meets one or more of the following conditions[1]:
  - Receives or contributes U.S. IOOS resources (either funding or in-kind support), excluding the legislative branch
  - Is identified as a partner or potential partner in planning, programming, or budgeting documentation
  - Supports the development or implementation of U.S. IOOS by contributing capabilities—products, services, data, expertise, or infrastructure
- A U.S. IOOS "**core variable**" is one of 26 oceanographic variables, selected by the U.S. IOOS community, on which data is required to detect and/or predict changes in a maximum number of phenomena of interest to the ocean observing community

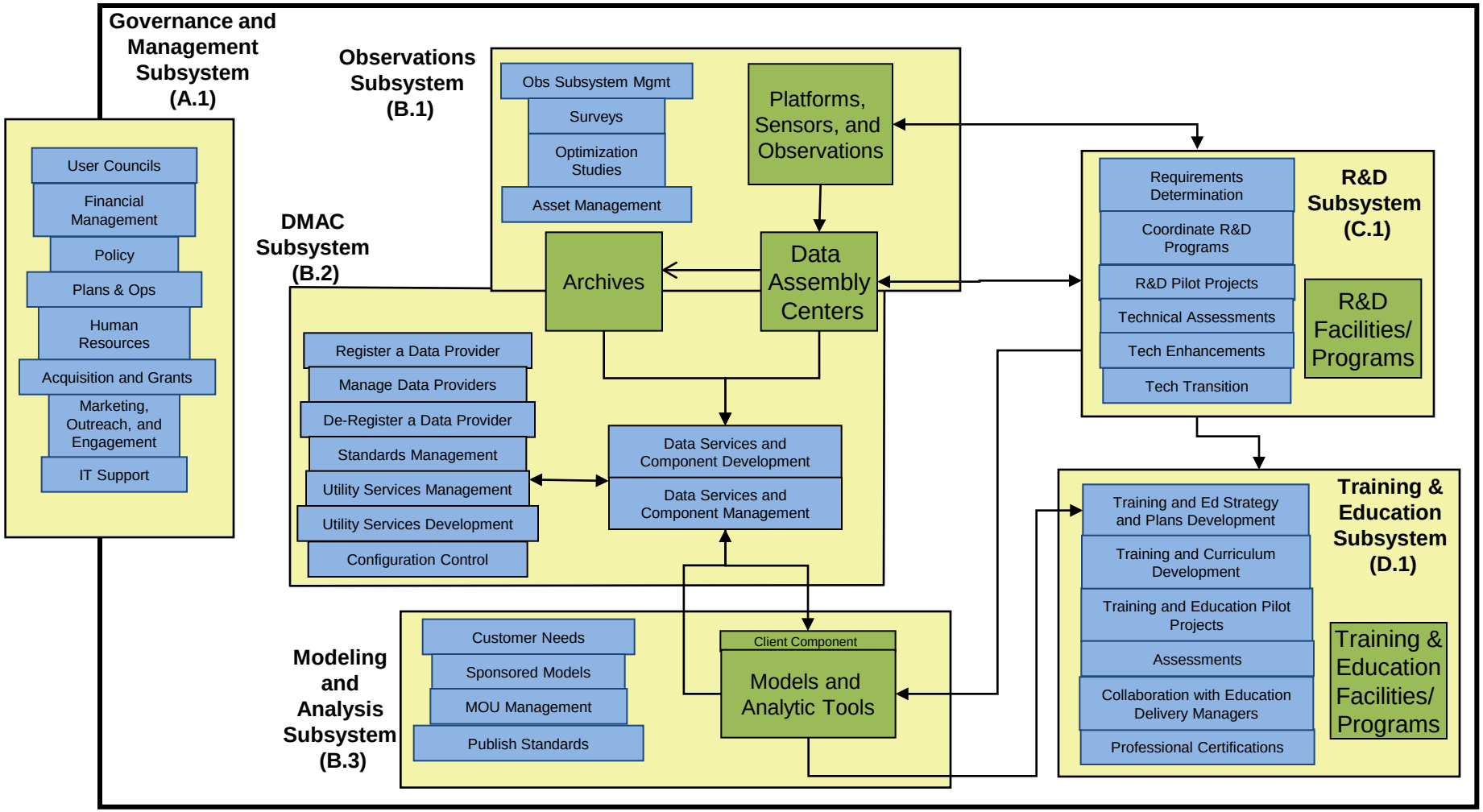
[1] *U.S. Integrated Ocean Observing System: A Blueprint for Full Capability* (Version 1.0, November 2010)

U.S. IOOS Scope – Collaboration Among Partners



U.S. IOOS' partners—Global, National, and Regional—play an essential role in implementing U.S. IOOS' capabilities.

U.S. IOOS Scope Detail – Assets & Functions



U.S. IOOS Subsystem Boundaries

U.S. IOOS Assets (Tools/Infrastructure)

U.S. IOOS Major Execution/Management Functions (37 Core Functional Activities)

Respondents to the Assessment

- National Oceanic and Atmospheric Administration (NOAA)
- National Science Foundation (NSF)
- National Aeronautic & Space Administration (NASA)
- Environmental Protection Agency (EPA)
- Bureau of Ocean Energy Management (BOEM)
- Marine Mammal Commission (MMC)
- Office of Naval Research (ONR)
- Oceanographer of the Navy, representing the Joint Chiefs of Staff (JCS)
- U.S. Army Corps of Engineers (USACE)
- U.S. Coast Guard (USCG)
- U.S. Geological Survey (USGS)
- National Park Service (NPS)

- Alaska Ocean Observing System (AOOS)
- Caribbean Regional Association (CaRA)
- Central and Northern California Ocean Observing System (CeNCOOS)
- Gulf of Mexico Coastal Ocean Observing System (GCOOS)
- Great Lakes Observing System (GLOS)
- Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS)
- Northwest Association of Networked Ocean Observing Systems (NANOOS)
- Northeastern Regional Association of Coastal and Ocean Observing Systems (NERACOOS)
- Pacific Regional Integrated Ocean Observing System (PacIOOS)
- Southern California Coastal Ocean Observing System (SCCOOS)
- Southeast Coastal Ocean Observing Regional Association (SECOORA)
- Alliance for Coastal Technologies (ACT)

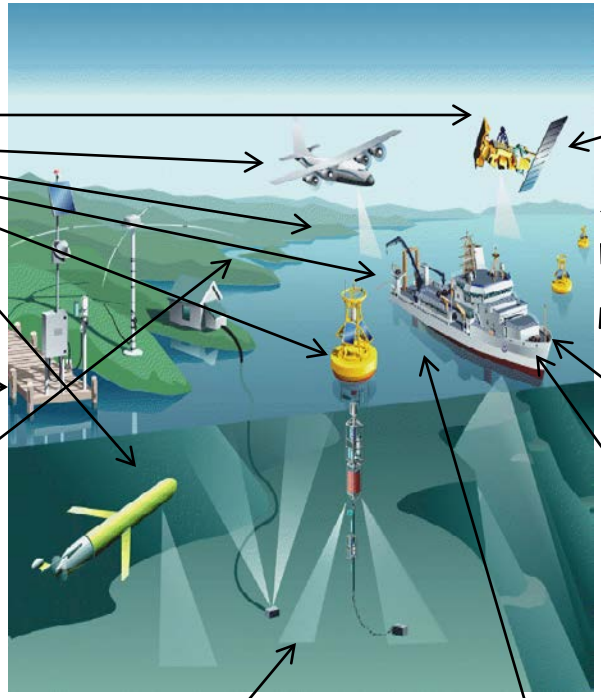
U.S. IOOS Assessment Results: Partner Assets

General Capability Assessment: Assets

- The General Capabilities section of the Assessment cataloged ocean observing assets of Federal and Regional partners that can contribute, or are contributing, to U.S. IOOS in the areas of:
  - Observing Systems
  - Data Management & Communications (DMAC)
  - Research and Development
  - Training and Education
- U.S. IOOS ocean observing assets, as derived from the U.S. IOOS Assessment responses, are listed in the subsequent slides.

U.S. IOOS Partner Reported Observing System Assets

Observing Assets Measuring U.S. IOOS Core Variables



45 obs systems & obs asset database (NOSA)

2 satellite obs systems

4 obs systems

1,500 obs platforms

Regional IOOS

4 obs programs

21 obs systems

4 obs systems

8 water resource programs & 1 satellite obs system

Animal-borne sensors

Defense-related obs systems

U.S. IOOS DMAC Subsystem Capabilities

Data Assembly Centers (20)

- NDBC (IOOS RAs (GTS), OceanSITES, TAO)
- CO-OPS
- CoastWatch
- Regional DACs (11)
- Univ. of Hawaii Sea Level Center (Global Tide Gauge Network)
- PMEL (Global Tropical Moored Buoy Array)
- NRL / USGODAE (Argo)
- NPS Federal data center at the South Florida Natural Resources Center
- EPA – STORET/Water Quality Exchange Data Warehouse
- DOE Carbon Dioxide Information Analysis Center (CDIAC)

33 U.S. IOOS DMAC subsystem capabilities

Data Archive Centers (6)

- NODC
- NCDC
- NGDC
- NASA Distributed Active Archive Centers (DAACs) – Goddard DAAC and Physical Oceanography DAAC at JPL
- DOE Carbon Dioxide Information Analysis Center (CDIAC)

DMAC Data Access Services (5)

Data Access Service	Accomplished	Ongoing Work
SOS	Prototype Solution in use NDBC, CO-OPS, some RAs; USACE water-level project	Expanded development
CF-NetCDF - OPENDAP	RA model outputs (structured grids) available	Expand to unstructured grids and in situ
KML (through SOS)	Available NDBC, CO-OPS	Expand to RAs
CSV (through SOS)	Available NDBC, CO-OPS, some RAs	Expand to remaining RAs
Biological Variables	Developed an information framework to integrate U.S. IOOS core biological observations (fish species, and fish abundance); now implemented at PacIOOS	Expand to remaining RAs

DMAC Utility Services (2) (Federal and Regional)

- RCV (registry, catalog, viewer) – V1 produced; V2 under development
  - Service registry
  - Data catalog service

U.S. IOOS Partner Reported Observing R&D Assets

35 Regional IOOS research programs

Over **40** Federal partner R&D ocean observing facilities/programs, plus a network of **35** Regional partner R&D programs
(schools, curricula, science centers, aquaria, institutes, workshops, reserves, sanctuaries)

- U.S. Army Engineer Research and Development Center (ERDC) Coastal and Hydraulics Laboratory (CHL)
- Joint Airborne Lidar Bathymetry Technical Center of Expertise

- Pacific Marine Environmental Laboratory
- Earth System Research Laboratory National Severe Storms Laboratory
- Air Resources Laboratory
- Great Lakes Environmental Research Lab
- Atlantic Oceanographic & Meteorological Lab
- Geophysical Fluid Dynamics Laboratory
- Ocean Exploration and Research
- Climate Program Office
- National Sea Grant College Program
- Office of Weather and Air Quality
- Center for Coastal Fisheries & Habitat Research
- Center for Coastal Monitoring & Assessment
- Center for Environmental Health & Biomolecular Research
- Ocean Systems Test and Evaluation Program
- Center for Sponsored Coastal Ocean Research
- Coast Survey Development Laboratory
- National Geodetic Survey Geosciences Research Division
- Hollings Marine Laboratory
- National Geodetic Survey Remote Sensing Research Group
- Center for Human Health Risk at the Hollings Marine Laboratory
- Cooperative Oxford Lab
- Center for Satellite Applications & Research
- National Climatic Data Center
- Alaska Fisheries Science Center
- Northeast Fisheries Science Center
- Northwest Fisheries Science Center
- Pacific Islands Fisheries Science Center
- Southeast Fisheries Science Center
- Southwest Fisheries Science Center
- National Systematics Laboratory
- National Seafood Inspection Laboratory
- Environmental Modeling Center
- Meteorological Development Laboratory
- Office of Hydrological Development's Hydrology Laboratory
- Space Weather Prediction Center
- National Centers for Environmental Prediction

Marine monitoring programs

Ocean Observatories Initiative (OOI), the R&D contribution to U.S. IOOS

Independent verification & validation

U.S. IOOS Partner Training & Education Assets

29 reported partner ocean observing Training & Education facilities & programs

Grade School (K-12)

Federal

BOEM Bureau of Ocean Energy Management

ONR Science & Technology

NOAA

NASA

USGS

Regional

AOOS Alaska Ocean Observing System

CaRA

CeNCOOS

GLOS

NERACOOS

PacIOOS Pacific Islands Ocean Observing System

GCOOS Gulf of Mexico Coastal Ocean Observing System

MARACOOS Ocean Information for a Changing World

NANOOS

SECOORA Southeast Coastal Ocean Observing Regional Association

Southern California Coastal Ocean Observing System

College / University

Federal

ONR Science & Technology

NOAA

USACE

NASA

USGS

Regional

AOOS Alaska Ocean Observing System

CeNCOOS

NERACOOS

PacIOOS Pacific Islands Ocean Observing System

GCOOS Gulf of Mexico Coastal Ocean Observing System

MARACOOS Ocean Information for a Changing World

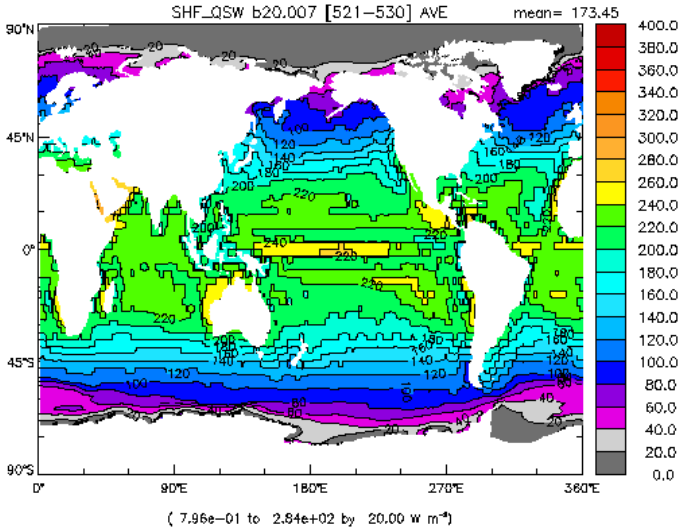
NANOOS

SECOORA Southeast Coastal Ocean Observing Regional Association

Southern California Coastal Ocean Observing System

U.S. IOOS Modeling Subsystem Assets

- Cataloging all models employing U.S. IOOS core variables and maintaining an accurate database is a major effort that was not undertaken as part of this Assessment.
- The U.S. IOOS Program's role is to:
  - Simplify access to data to support models
  - Simplify access to data outputs for customers
  - Help match customer needs to existing models
  - Assist with prototyping and testing of models



U.S. IOOS Assessment Results: Partner Core Functional Activities

U.S. IOOS Core Functional Activities

- The remainder of the Assessment addressed the status of partner capabilities to conduct U.S. IOOS Core Functional Activities (CFAs)
  - CFAs describe U.S. IOOS Program coordination and management products and services
  - CFAs are derived from stated or implied requirements in:
    - ICOOS Act of 2009
    - IWGOO Strategic Plan (2008)
    - First U.S. IOOS Development Plan (2006)
- CFAs are described in detail in the *U.S. IOOS: A Blueprint for Full Capability*.
  - CFA descriptions include all necessary subactivities.

Partner CFA Evaluation Criteria

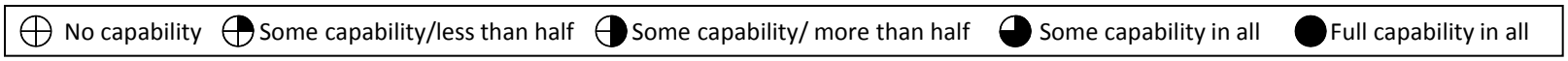
- A partner is considered to have a significant U.S. IOOS capability in a core functional activity (CFA) if the partner routinely performs most or all of the subactivities within that CFA.
  - Regional partners were evaluated as coordinators and administrators of IOOS within their respective Regions across all 37 CFAs.
  - Federal partners were evaluated as potential contributors to the National IOOS across all 37 CFAs.
- "Harvey Ball" graphics (⊕) were employed to display results.

	Definition
⊕	No capability
◔	Some capability in less than half of the Blueprint-identified subactivities
◑	Some capability in more than half of the Blueprint-identified subactivities
◕	Some capability in all the Blueprint-identified subactivities
●	Full capability in all the Blueprint-identified subactivities

Findings: Regional Partners (Summary)

U.S. IOOS Subsystem	Range of Regional IOOS Capability Findings	
	Minimum Regional Capability	Maximum Regional Capability
A.1 Governance and Management		
B.1 Observing Systems Subsystem		
B.2 DMAC Subsystem		
B.3 Modeling and Analysis Subsystem		
C.1 Research and Development		
D.1 Training and Education		

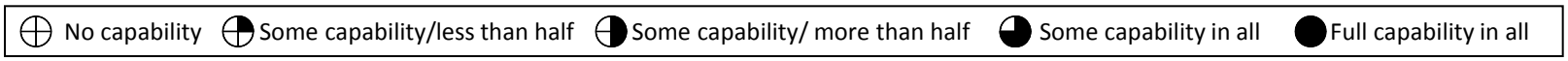
- Regions collectively display solid foundation of U.S. IOOS capability
- There is variation in the level of capability among the Regions
- No Region has full capability in each subsystem



Findings: Federal Partners (Summary)

Federal partners' capabilities can help advance U.S. IOOS development.

U.S. IOOS Subsystem	U.S. IOOS Program Office Functional Capabilities (Current)	Federal Partners with Gap-Filling Capabilities in These Core Functions	Composite Across All Federal Partners (Possible)
A.1 Governance and Management (8 core functions)			
B.1 Observing Systems Subsystem (4 core functions)		NOAA, USACE, Navy/ONR	
B.2 DMAC Subsystem (9 core functions)		USACE, USGS, NOAA	
B.3 Modeling & Analysis Subsystem (4 core functions)		USACE, USGS	
C.1 Research & Development (6 core functions)		USACE, USGS, NOAA, Navy/ONR, BOEM	
D.1 Training and Education (6 core functions)			



Key Federal Partner Findings

- U.S. IOOS Assessment revealed significant diversity in the capabilities and capacities of its member organizations (*e.g.*, differences among Federal agencies, foundations, and commissions).
- There are Federal partners active in all CFAs except for D.1.4 (Training and Education Assessments).
- Some Federal partners routinely perform CFAs to meet their organizational mission needs.
- There are potential opportunities in a subset of the Federal partners for leveraging CFA support to U.S. IOOS.