



Northwest Association of Networked Ocean Observing Systems
The Integrated Ocean Observing System (IOOS)
Regional Association for the Pacific NW



www.nanoos.org



NANOOS

NORTHWEST ASSOCIATION OF NETWORKED OCEAN OBSERVING SYSTEMS



WASHINGTON - OREGON - NORTHERN CALIFORNIA

1. Call to Order

Welcome, Charge for the Day

David Martin
NANOOS GC Board Chair



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2. Group Introductions



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3. IOOS Update

Jenifer Rhoades
NOAA US IOOS Office



IOOS Program Update
Jenifer Rhoades
US IOOS Program
August 20, 2015

IOOS By the Numbers



3.8M
Webpage views of IOOS data via RA websites



2.8M
Coastal and Ocean Observations served by U.S. IOOS in 2014



600
Private Sector Members of the Ocean Enterprise



5,186
Datasets, and



4,034
Services are available through the IOOS Catalog

165
Funded Regional Association Partners



Source: IOOS Office

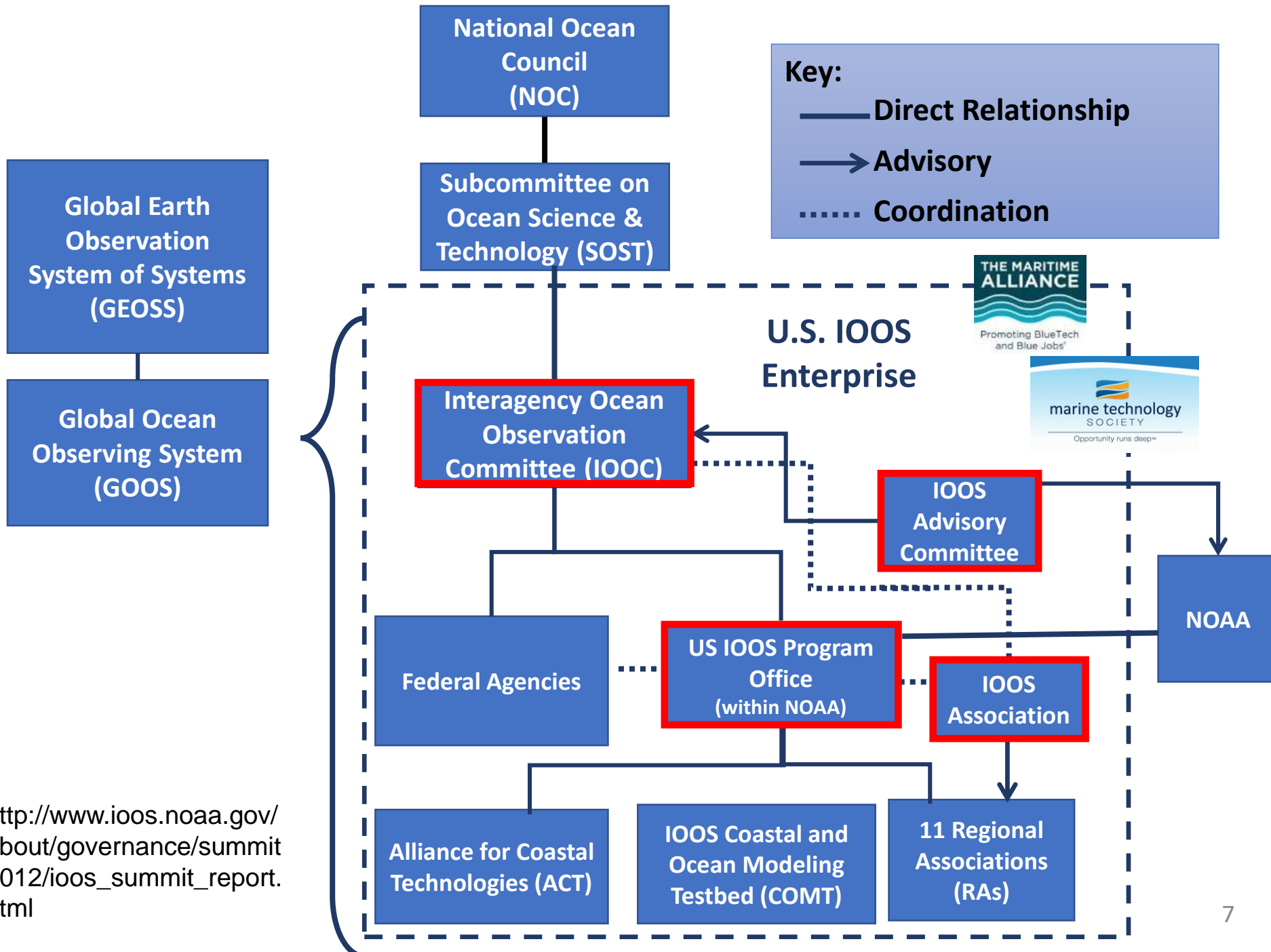
\$70M
Total Appropriated Funds in FYs 13-14



\$13.025M
NOAA IOOS National Funding*

\$57M IOOS Regional Observations*

* PPA, Post-recissions



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

Staffing and Leadership Update

IOOS Office Changes: 75% of our 4 leadership positions changed in past 15 months

- New Deputy Director Carl Gouldman
- Hired George Jungbluth as RB&P Division Chief
- Hired Derrick Snowden as Operations and Communications Division Chief
- Hired Kathleen Bailey as new Oceanographer in OPS-C division
- Nancy Seeger is new Communications point of contact
- Torie Ketcham is our part-time web developer
- Jennifer Bosch is a new Scientist in the OPS-C Division
- LCDR Eric Johnson Action and Project

NOS Roadmap

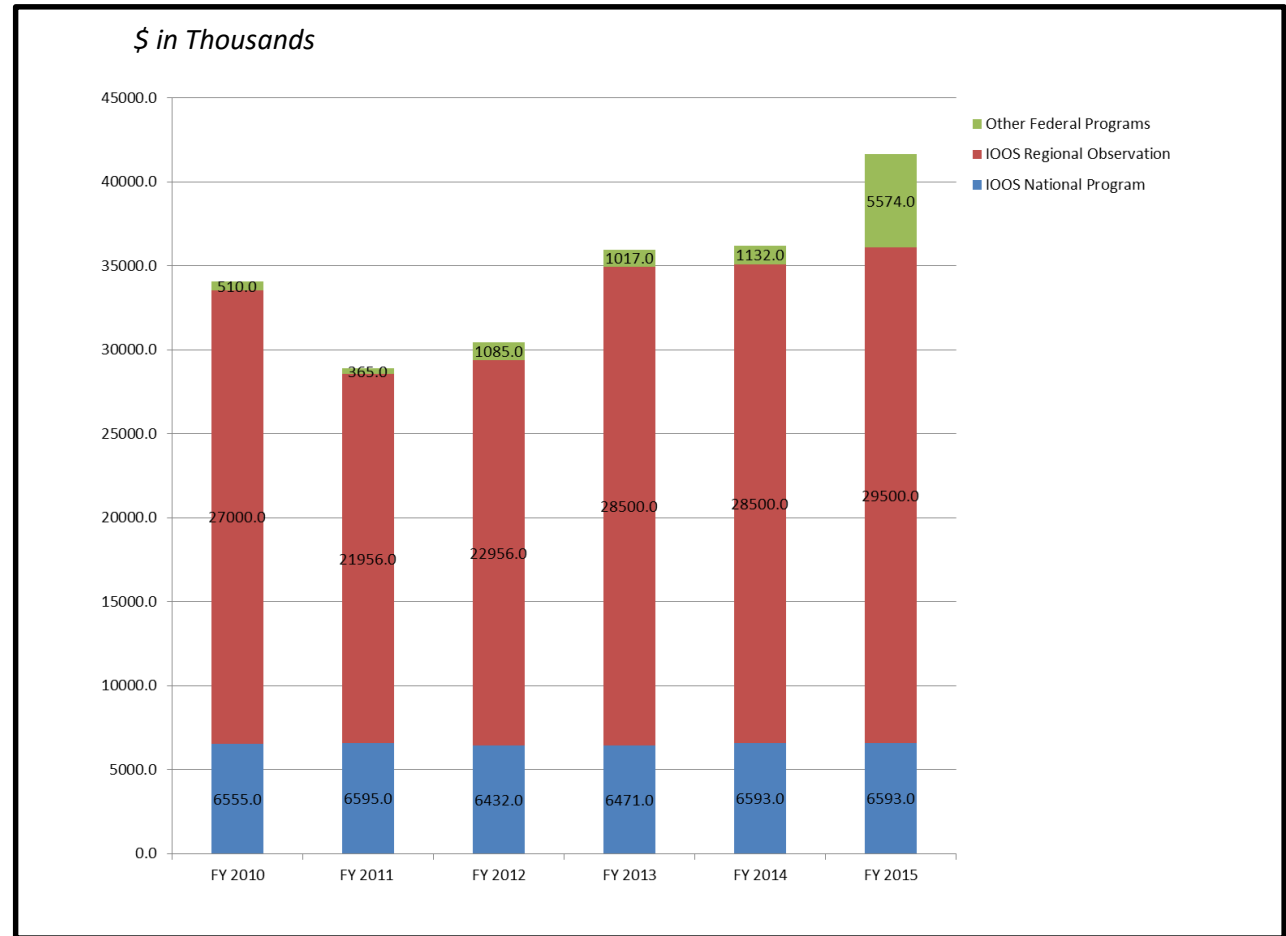
- 3 Core Priorities:
 - Coastal Resilience: Preparedness, Response, Recovery
 - Coastal Intelligence
 - Place-based conservation
- Guides all strategic planning and new funding decisions within NOS.
- **IOOS has been successful in seeking additional support and new funding from NOS when linking activities to Roadmap priorities.**

U.S. IOOS[®]: Program Office

IOOS Budget History: FY 2010 - 2015

IOOS Office Primary Roles:

- (1) Provide Programmatic Leadership
- (2) Foster Operational Capability
- (3) Forge Robust Partnerships
- (4) Champion Regional and Stakeholder Interests



Forward Look FY2015 -16

- DMAC
- Communities of Practice
- Marine Sensor Innovation
- Marine Biodiversity Observation Network (BON)
- Ocean Enterprise Study
- IOOS Advisory Committee
- Certification
- FY16 Federal Funding Opportunity
- Communicating IOOS successes to Agency Leaders and on the Hill



US IOOS Program Office: DMAC Focus



Technical solutions
Technology



Implementation across the
enterprise

Process



Building community

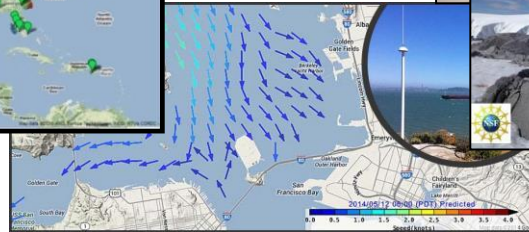
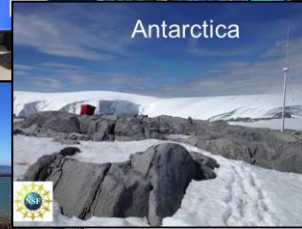
People

DMAC is the collection of people, process, and technology that enable the dissemination of diverse and distributed data sets using the WWW as the platform.

IOOS is deploying, and in some cases building, infrastructure to enable this dissemination.

IOOS: Advancing Communities

HF Radar:



Biological Variables & BIO TT

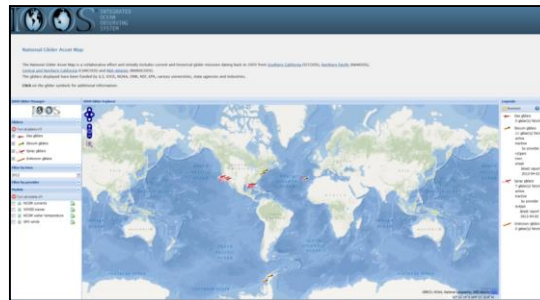
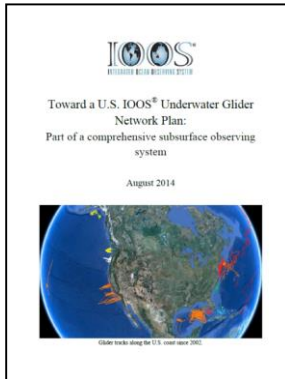
WORKSHOP REPORT

Biological and Ecosystem Observations within U.S. Waters:

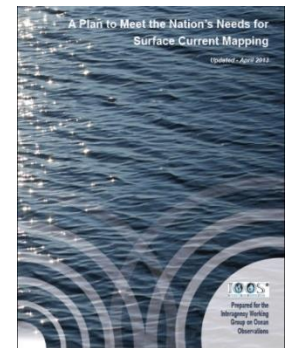
A Workshop to Inform Priorities for the U.S. Integrated Ocean Observing System®

Convened by the Interagency Ocean Observation Committee (IOOC) Biological Integration and Observation (BIO) Task Team

Gliders:



Wave Measurements:



Animal Telemetry:



Alliance for Coastal Technologies



Nutrient Sensor Challenge

(FY2015/2016)

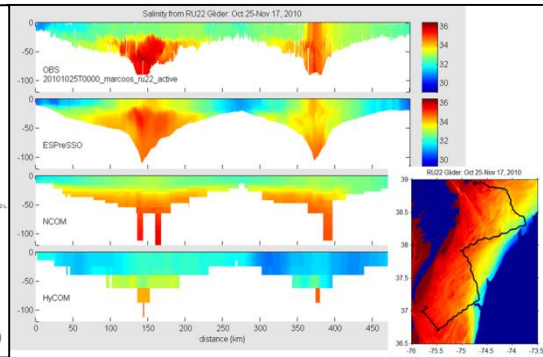
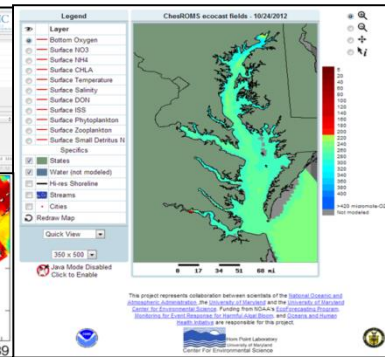
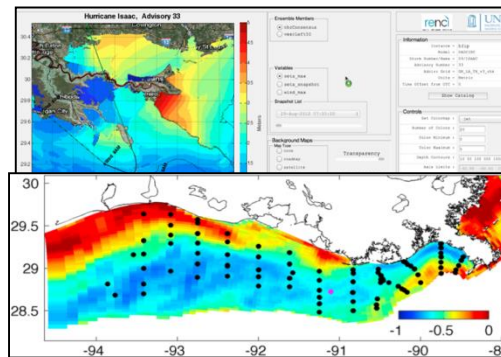
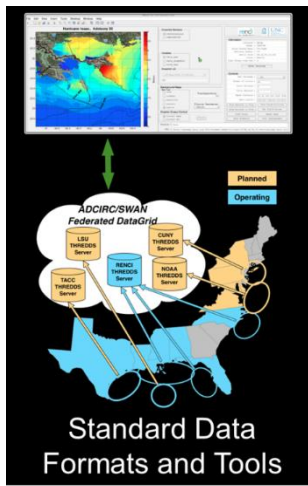
ACT Services

- ⊕ A third-party testbed for evaluating technologies
 - ⊕ pH Sensors (2013/2014) – 7
 - ⊕ DO Sensors II (2014/2015) – 10
- ⊕ A forum for capacity and consensus building
- ⊕ An information clearinghouse for environmental technologies



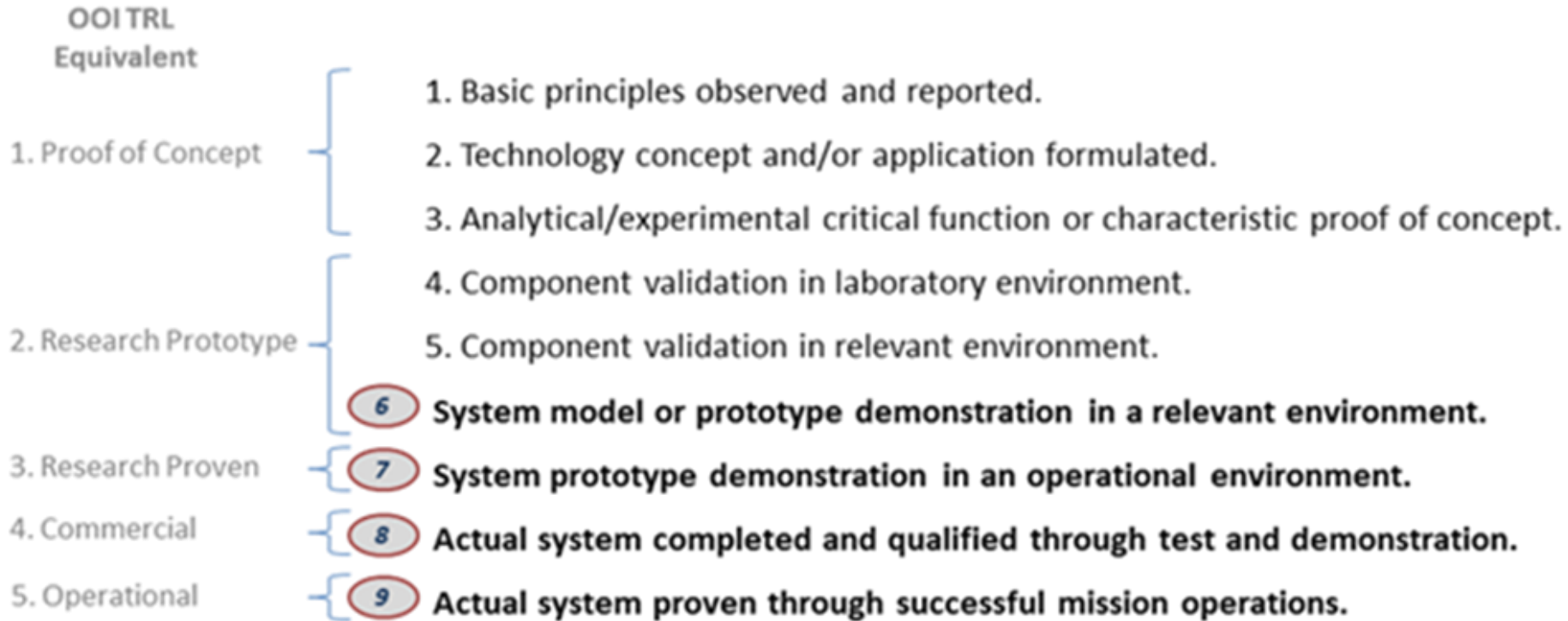
US IOOS Coastal & Ocean Modeling Testbed

- Venue to facilitate testing and transitions into operations.
- Improving ties to different NOAA and partner Agency modeling efforts.
- 5 projects; Hypoxia in Chesapeake Bay and Gulf of Mexico, Inundation in PR/USVI, West Coast Operational Forecast System, CI tools for comparing models/data



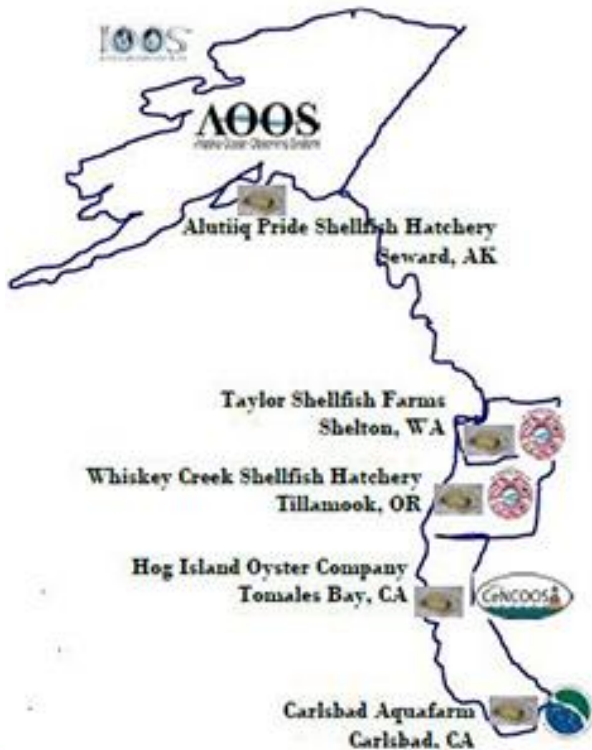
Ocean Technology Transition

Fostering the transition of marine sensor and other advanced observing technologies to operations mode.

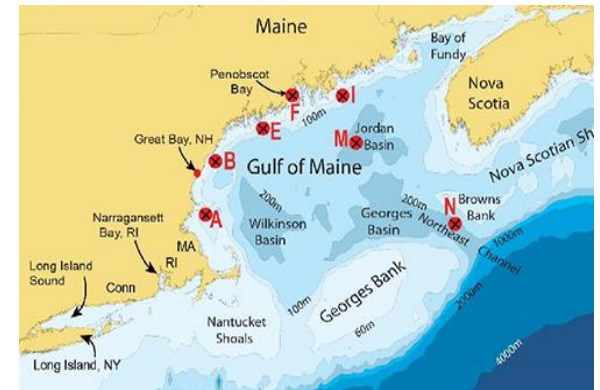


Ocean Technology Transition Projects

- West Coast Ocean Acidification
- Predicting Harmful Algal Blooms in PNW and NE
- Shark Tracking in Hawaiian Islands
- NE Nutrient Observatory
- Detecting Arctic Ice Freeze-up
- Imaging Flow Cytobot for SF Bay to support water quality monitoring



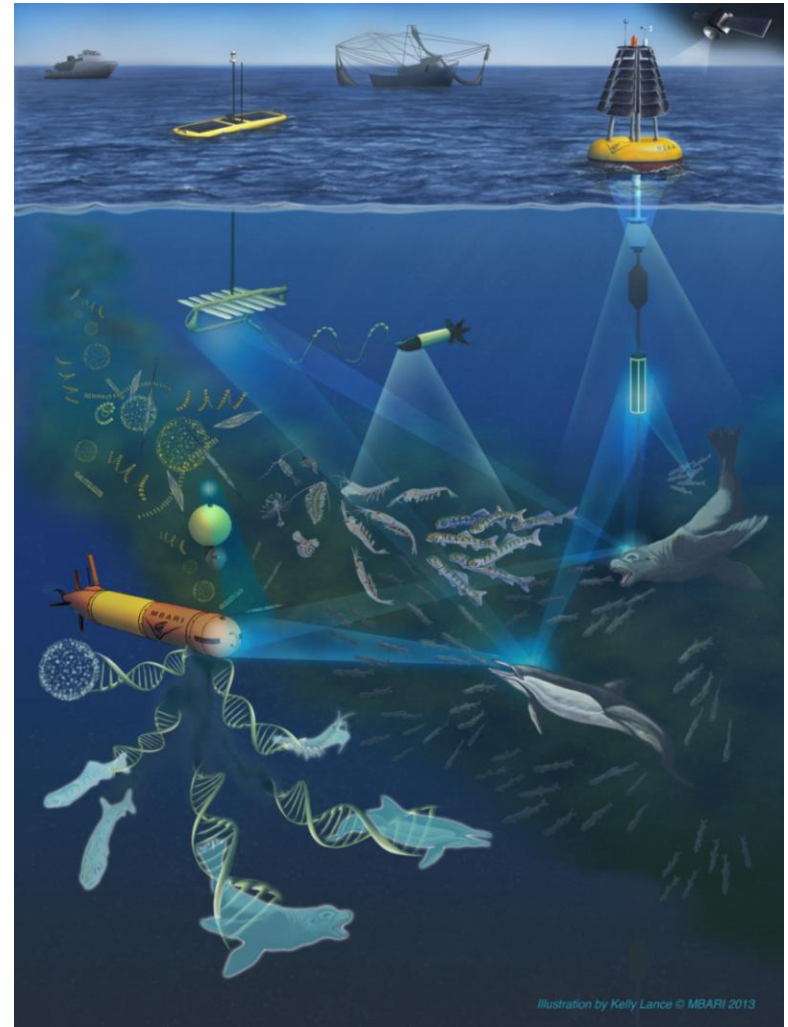
Imaging Flow CytoBot in SF Bay – Industry Partner: McLain & Axiom



Operational Nutrient Observatory for the Northeastern United States – Industry Partner: WetLabs

Marine Biodiversity

- U.S. launched 3 Marine Biodiversity Observation Network projects to show marine and coastal data could be integrated into the system
- U.S. contribution to GEO BON is focused in in four regional geographies: the Florida Keys, Monterey Bay, Channel Islands, and the U.S. Chukchi Sea continental shelf.
- <http://www.ioos.noaa.gov/biodiversity/welcome.html>

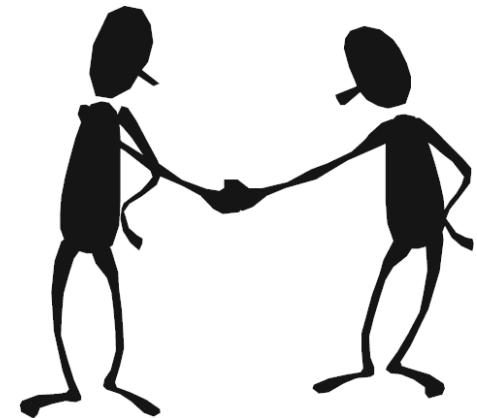


Credit: MBARI

FY2016 RA Federal Funding Opportunity

Timeline:

- Published Announcement – February 2015
- Proposal Close date – August 31, 2015
- Merit Review ~ October 2015
- Forward Recommendations for Approval ~ March 2016
- Award Start Date – 1 June 2016



Ocean Enterprise Study of U.S. Businesses

- >600 private sector firms
- Most companies < 10 employees
- 83% providers;
9% intermediaries
- Input Needed:
<http://www.usworks.com/usioos/>



MIST
Science & Technology
Cluster
HANCOCK COUNTY
Port & Harbor
Commission




MSET
MEMBERSHIP ENTERPRISE FOR TECHNOLOGY
SERVICES SECTOR

NEW REPORT DETAILS

**MISSISSIPPI'S "BLUE" ECONOMY
& IS LEADING TO
MARITIME BUSINESS CLUSTER DEVELOPMENT**








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The Ocean Enterprise:
A study of US business activity in
ocean measurement, observation
and forecasting
<http://www.usworks.com/usioos/>

Year One Report



Prepared by
ERISS Corporation
The Maritime Alliance
November 10, 2014



National Oceanic and Atmosphere Administration

Kudos

- *In-situ* water quality monitoring asset for Coos Bay, Oregon in NVS.
- IOOS Pacific Ocean Acidification Portal
- Pacific Anomalies Science and Technology Workshops
- Climatology App

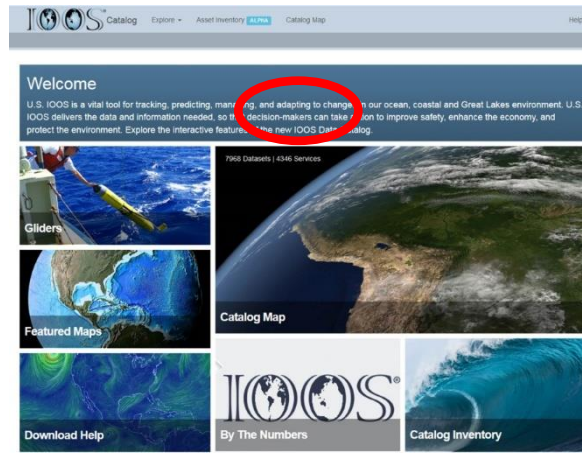
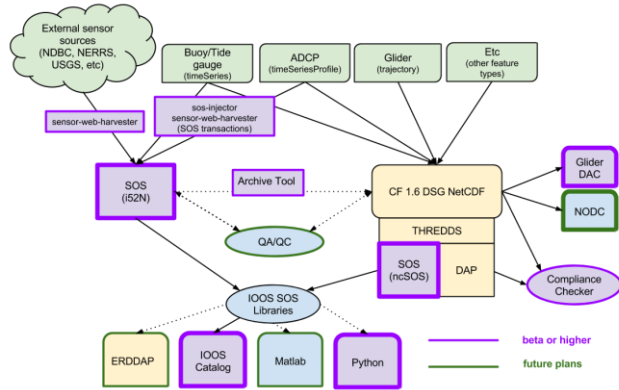
Thank You

Questions?

Jenifer.rhoades@noaa.gov

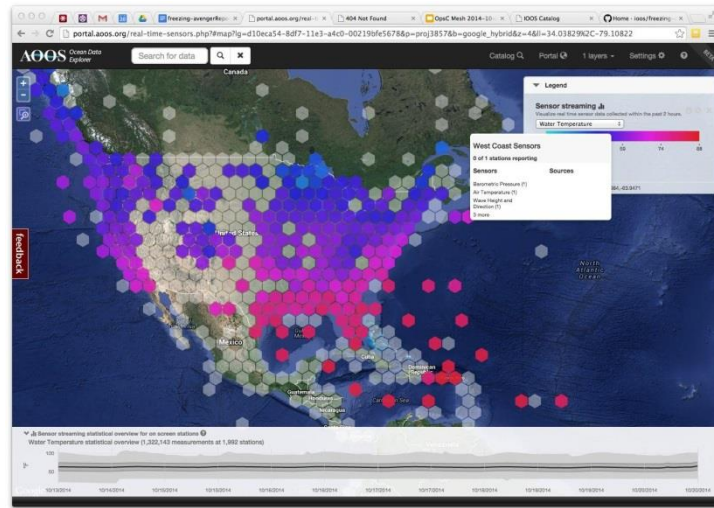
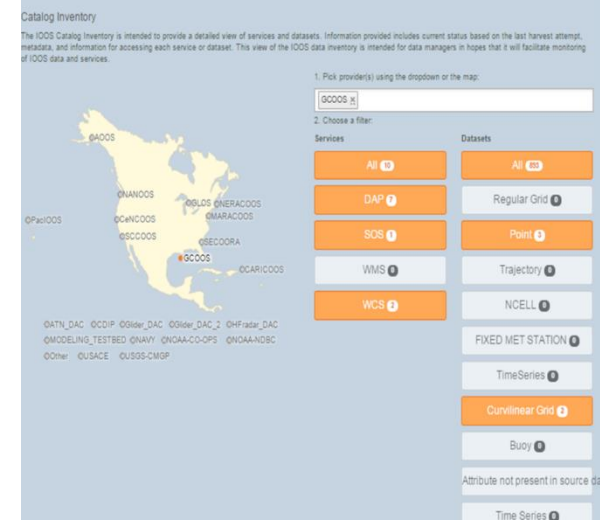
Backup

DMAC What's New



SOCIAL MEDIA

NEWS:





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4. NANOOS Update

Jan Newton

NANOOS Executive Director



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NANOOS Governing Council Members 8/2015



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1. Ocean Inquiry Project
2. OR Dept of Land Conservation & Development
3. Surfrider Foundation
4. The Boeing Company
5. Oregon State University
6. Oregon Sea Grant
7. Puget Sound Partnership
8. University of Washington
9. Washington Sea Grant
10. WET Labs, Inc.
11. Oregon Health and Sciences University
12. Quileute Indian Tribe
13. OR Dept of Geology and Mineral Industries
14. Humboldt State University
15. Marine Exchange of Puget Sound
16. WA Dept of Ecology
17. Pacific Northwest National Laboratory
18. Port of Newport
19. Puget Sound Harbor Safety Committee
20. Sound Ocean Systems, Inc.
21. Council of American Master Mariners
22. Pacific Northwest Salmon Center (& HCSEG)
23. Northwest Indian Fisheries Commission
24. Sea-Bird Electronics, Inc.
25. Western Association of Marine Laboratories
26. Science Applications International Corporation / Leidos
27. OR Dept of Fish and Wildlife
28. King County Dept Natural Resources & Parks
29. Quinault Indian Nation
30. Western Resources and Applications
31. OR Dept of State Lands
32. Columbia River Crab Fisherman's Association
33. Port of Neah Bay
34. Northwest Research Associates
35. Pacific Ocean Shelf Tracking Project
36. WA Dept of Fish and Wildlife
37. Northwest Aquatic and Marine Educators
38. Seattle Aquarium
39. NOAA Northwest Fisheries Science Center
40. Port Gamble S'Klallam Tribe
41. The Nature Conservancy
42. Portland State University
43. NOAA Olympic Coast National Marine Sanctuary
44. University of Victoria
45. University of Oregon
46. Port Townsend Marine Science Center
47. Intellicheck-Mobilisa
48. NortekUSA
49. Grays Harbor Historical Seaport Authority
50. Pacific Coast Shellfish Growers Association
51. US Army Corps Engineers
52. Olympic National Park
53. Oak Harbor Middle School
54. Vancouver Island University
55. Ocean Networks Canada
56. Lower Columbia Estuary Partnership
57. Western Washington University
58. Raincoast GeoResearch
59. WA Dept of Health
60. Say Yes to Life Swims

KEY: ■ Tribal Government ■ Industry ■ NGO ■ Academia/Research ■ Federal/State/Local Government



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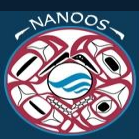
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New NANOOS members

- Raincoast GeoResearch
- Washington Dept. of Health
- Say Yes to Life Swims

Soon!!

- NOAA PMEL



NANOOS budget:

FY07-09: \$1.4M + 0.4M = \$1,800,000

Year 1, 2, 3

FY10: \$1.7M + 0.4M = \$2,100,000

Year 4

FY11: \$2,087,500 (*w/ new start date*)

Year 5 or 1 of new 5-y award

FY12: \$2,428,291 (\$2,288,000 base; ~\$140K for DMAC, OA workshops)

Year 6 or 2

FY13: \$3,089,477 (\$2,392,136 base; ~\$700K for MSI on OA plus OAP)

Year 7 or 3

FY14: \$2,818,441 (\$2,442,136 base; \$109K HF; \$217K OAP; \$50K glider)

Year 8 or 4

FY15: \$2,771,890 (\$2,462,136 base; \$187K OAP obs; \$122K OAP adds)

Year 9 or 5



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NANOOS budget:

FY11: \$2,087,500 (*w/ new start date*)

Year 5 or 1 of new 5-y award

FY12: \$2,288,000 base: change in start date, level funding

Year 6 or 2

FY13: \$2,392,136 base: \$104k enhance Obs

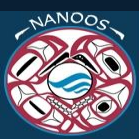
Year 7 or 3

FY14: \$2,442,136 base: \$50k enhance DMAC

Year 8 or 4

FY15: \$2,462,136 base: \$20k enhance glider data presentation

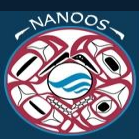
Year 9 or 5



HABs

“Operational ecological forecasting of harmful algal blooms in the Pacific Northwest using an environmental sample processor”

- ESP on Cha'ba at La Push
- UW, NOAA NWFSC, MBARI, NOAA CCEHBR, NWIC, Spyglass, WHOI
- Detects *Pseudo-nitzschia* cells, species, toxicity
- Strong support from coastal tribes
- Tested in PS 2013; NANOOS served data
- HAB bulletin not funded, but still hoping to do



OA

“Turning the headlight on 'high': Improving an ocean acidification observation system in support of Pacific coast shellfish growers.”

- New “ACDC” pCO₂ sensor
- UW, OSU, Sunburst, AOOS, CeNCOOS, SCCOOS, NOAA PMEL, PCSGA
- Lower cost pCO₂ for “weather” grade data
- Strong support from shellfish industry
- Builds on current MSI award for Burke-o-lators in more hatcheries and new IPACOA portal



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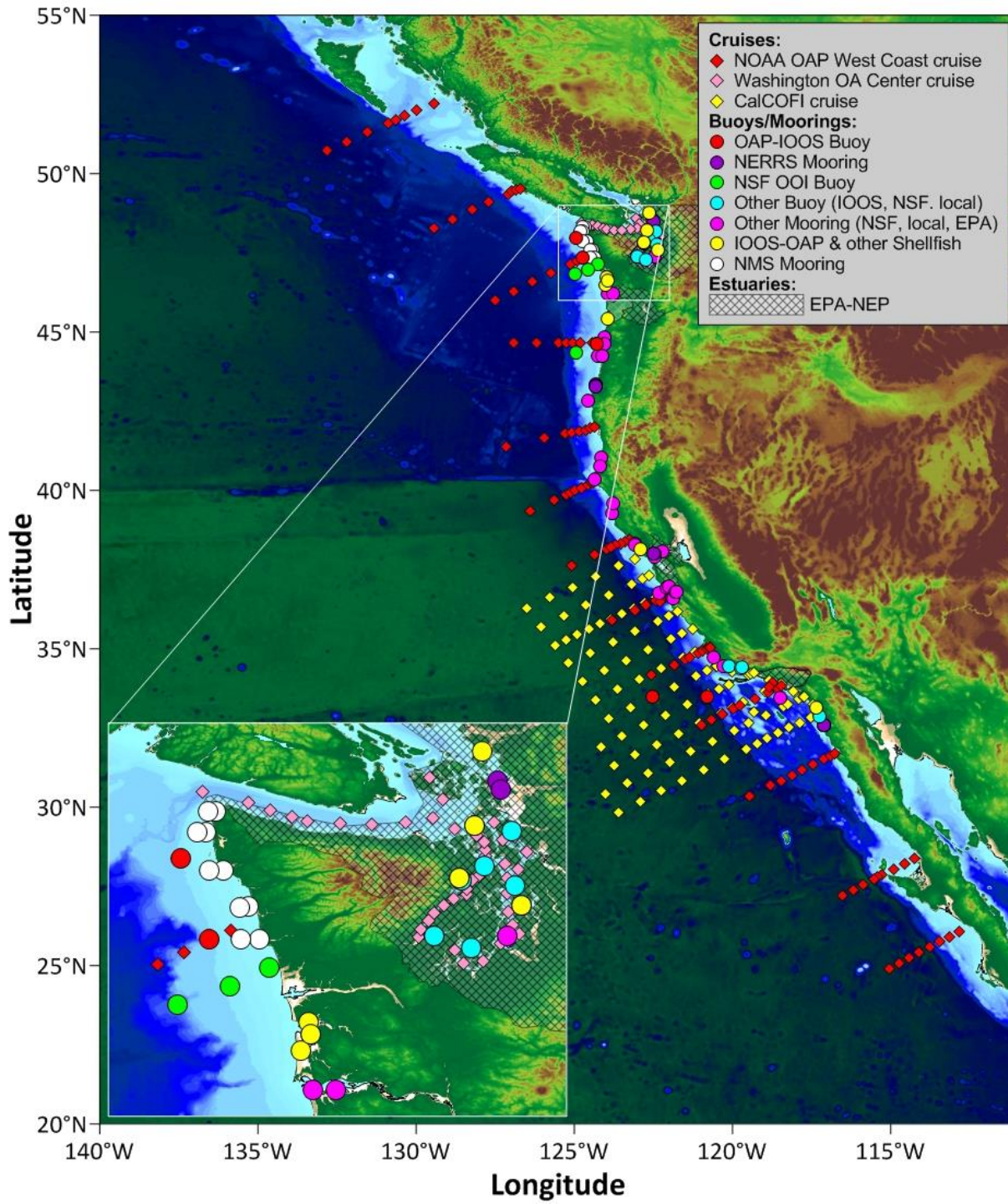
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Other NANOOS activity

- The “Blob”: workshops and tracking app
- WDOH temperature sensors on NVS
- IPACOA portal for Pacific OA
- Buoy 46089 preservation!
- Pathogens workshop
- Ecological Forecasting
- LiveOcean new forecast
- HAB response
- NVS 4.0
- Teacher involvement



West Coast OA assets:

WCOAH Panel

X-Prize
Aquaria
Marine Labs

GOA-ON



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Accomplishments:

NANOOS sets bar high

The region is coming to NANOOS

NANOOS is supporting the region

NANOOS is relevant nationally

NANOOS leadership visible internationally

NANOOS uses its governance; is growing



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Challenges

- Sustaining infrastructure on ~level funding
- Respond to 5-y plan/proposal
 - Balance “sustain” with “new”



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NANOOS focus areas:

Coastal Ocean

Estuaries and Bays

Shorelines



NANOOS Stakeholder Priorities

The NANOOS Governing Council selected five areas from results of numerous regional workshops as the highest regional priorities because “these issues represent those having the greatest impact on PNW citizenry and ecosystems and, we believe, are amenable to being substantively improved with the development of a PNW Regional Coastal Ocean Observing System:”

- **Maritime Operations**
- **Ecosystem Assessment**
- **Fisheries and Biodiversity**
- **Coastal Hazards**
- **Climate**

IOOS Summit Declaration

INTERAGENCY OCEAN OBSERVING COMMITTEE

INTEGRATED OCEAN OBSERVING SYSTEM (IOOS)

IOOS SUMMIT 2012 DECLARATION

In the United States, critical decisions affecting our lives, livelihoods and quality of life depend on successful communication and understanding of accurate and reliable scientific information about our oceans, coasts and Great Lakes. The U.S. Integrated Ocean Observing System (IOOS®) is a coordinated national, international, regional and local network of observations, modeling, data management and communications that provides the knowledge needed by society to protect life and property, to sustain a growing economic vitality, to safeguard ecosystems, and to advance quality of life for all people. Building upon progress over the past several decades, we must continue to expand, improve, and sustain the system to address the growing societal needs for ocean observations and information.

BACKGROUND

The Interagency Ocean Observing Committee convened an IOOS Summit, on November 13-16, 2012, ten years after an initial workshop defining IOOS requirements. The participants at the Summit reviewed progress in the design and implementation of IOOS. They identified the notable successes in developing a functioning system, as well as the technical and practical challenges and opportunities that IOOS will face in the coming decade. This Declaration captures and emphasizes the findings and commitments of the participants in the Summit.

IOOS is a national endeavor that is endorsed by federal and state agencies, tribes, academia, industry and NGOs; and is a partnership at the national and regional levels through the federal agencies and the IOOS Regional Associations. The past ten years have seen substantial progress in designing and implementing U.S. IOOS. We are delivering real value to the American public and foresee even greater contributions in the coming decades.

UNDERSTANDING OF THE NEED FOR IOOS

Recent events underscore the importance of IOOS to the economic, security and environmental interests of the United States.

Sustaining NANOOS, the Pacific Northwest component of the U.S. IOOS

- 1) Maintain NANOOS as the PNW IOOS **Regional Association**.
- 2) Maintain surface **current and wave** mapping capability.
- 3) Sustain existing buoys and gliders in the PNW **coastal ocean**, in coordination with national programs.
- 4) Maintain observation capabilities in PNW **estuaries**, in coordination with local and regional programs.
- 5) Maintain core elements of **beach and shoreline** observing programs.
- 6) Contribute to a community of complementary **numerical regional models**.
- 7) Maintain NANOOS' **Data Management and Communications (DMAC)** system for routine operational distribution of data and information.
- 8) Deliver existing **user-defined products and services** for PNW stakeholders.
- 9) Sustain NANOOS **education and outreach** efforts.



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Strategy to develop a PNW Observing System

1. Integrate what we have (*observing assets, people, technologies*)
= federal, tribal, state, local, academic, NGO, and industry
2. Be strategic regarding what we need, based on priorities



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Strategy to **sustain** a PNW Observing System

1. **Support and harden** what we have (*observing assets, people, technologies*)
= federal, tribal, state, local, academic, NGO, and industry
2. Be strategic regarding what we need, based on priorities



New efforts proposed

- Forecasting
 - Wave forecasting
 - Flood & erosion forecasting
- OA and Hypoxia Observations
 - PNW hypoxia via crab pots
 - Central OR OAH
 - OCNMS OAH
 - Salish Sea OAH buoy with NWIC
- Biological Observations
 - Estuarine phytoplankton monitoring
 - Shelf plankton monitoring
- Human Connections
 - WCGA collaboration
 - Indigenous water network

NANOOS "Effort versus Application" Map for Observing and Modeling

APPLICATIONS: EFFORTS:	Coastal Ocean					Estuaries					Shorelines				
	mar ops	ecology	hazards	biodiversity	climate	mar ops	ecology	hazards	biodiversity	climate	mar ops	ecology	hazards	biodiversity	climate
Multivariable assets:															
WA shelf glider line	[Dark Blue]					[Grey]					[Grey]				
Columbia shelf, glider tracks															
CA shelf glider line	[Light Blue]					[Grey]					[Grey]				
WA shelf buoy															
Columbia shelf buoy	[Dark Blue]					[Grey]					[Grey]				
OR shelf buoy															
WA nearshore OAH	[Light Green]					[Grey]					[Grey]				
PNW nearshore hypoxia															
OR nearshore OAH	[Dark Blue]					[Grey]					[Grey]				
Puget Sound estuary buoys															
Puget Sound estuary ferrybox	[Light Blue]					[Dark Blue]					[Grey]				
Columbia estuary buoys															
South Slough estuary moorings	[Dark Blue]					[Grey]					[Grey]				
Salish Sea estuary buoy															
Biological sampling:															
OR shelf plankton timeseries	[Light Green] no plankton					[Light Green] no plankton					[Grey]				
OR estuarine timeseries	[Light Green] no plankton					[Light Green] no plankton					[Grey]				
Shorelines:															
Washington shorelines	[Grey]					[Grey]					[Dark Blue]				
Oregon shorelines	[Grey]					[Grey]					[Light Blue]				
PNW bathymetry	[Grey]					[Grey]					[Dark Blue]				
Surface currents:															
Oregon coastlines HF	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Grey]					[Light Blue]				
Washington coastlines HF	[Light Green] no WA	[Light Green]	[Light Green] no WA	[Light Green]	[Light Green] no WA	[Grey]					[Light Green] no WA	[Light Green]	[Light Green] no WA	[Light Green]	[Light Green] no WA
Critical coastal ports X-band	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]
Forecast models:															
PNW circulation forecasts	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Grey]				
Puget Sound circulation forecasts	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Grey]				
Columbia circulation forecasts	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Light Blue]	[Dark Blue]	[Grey]				
PNW biogeochem forecasts	[Grey]	[Dark Blue]	[Grey]	[Dark Blue]	[Grey]	[Grey]	[Dark Blue]	[Grey]	[Dark Blue]	[Grey]	[Grey]				
Puget Sound biogeochem forecasts	[Grey]	[Dark Blue]	[Grey]	[Dark Blue]	[Grey]	[Grey]	[Dark Blue]	[Grey]	[Dark Blue]	[Grey]	[Grey]				
Columbia estuary habitat forecasts	[Grey]	[Dark Blue]	[Grey]	[Dark Blue]	[Grey]	[Grey]	[Dark Blue]	[Grey]	[Dark Blue]	[Grey]	[Grey]				
Coastal wave forecasts	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green] no forecast	
Flood/erosion forecasts	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green] no forecast	[Light Green]	[Light Green] no forecast	[Light Green] no forecast	
KEY:															
<i>Italicized efforts indicate new investment</i>	[Dark Blue]	Currently directly supports	[Light Green]	Proposed to directly support	[Grey]	Not applicable	[Light Blue]	Currently indirectly supports	[Light Green]	Proposed to indirectly support	[Light Green] no ...	Text explains the current gap the proposed activities fill			



Coastal ocean:

Northern extent of California Current
Winds, topography, freshwater input, ENSO & other climate cycles

Major inland basins:

Puget Sound-Georgia Basin, Columbia River
Urban centers, nearshore development, climate variation

Coastal estuaries:

Willapa Bay, Grays Harbor, Yaquina Bay, Coos Bay, +20
Resource extraction, development, climate

Shorelines:

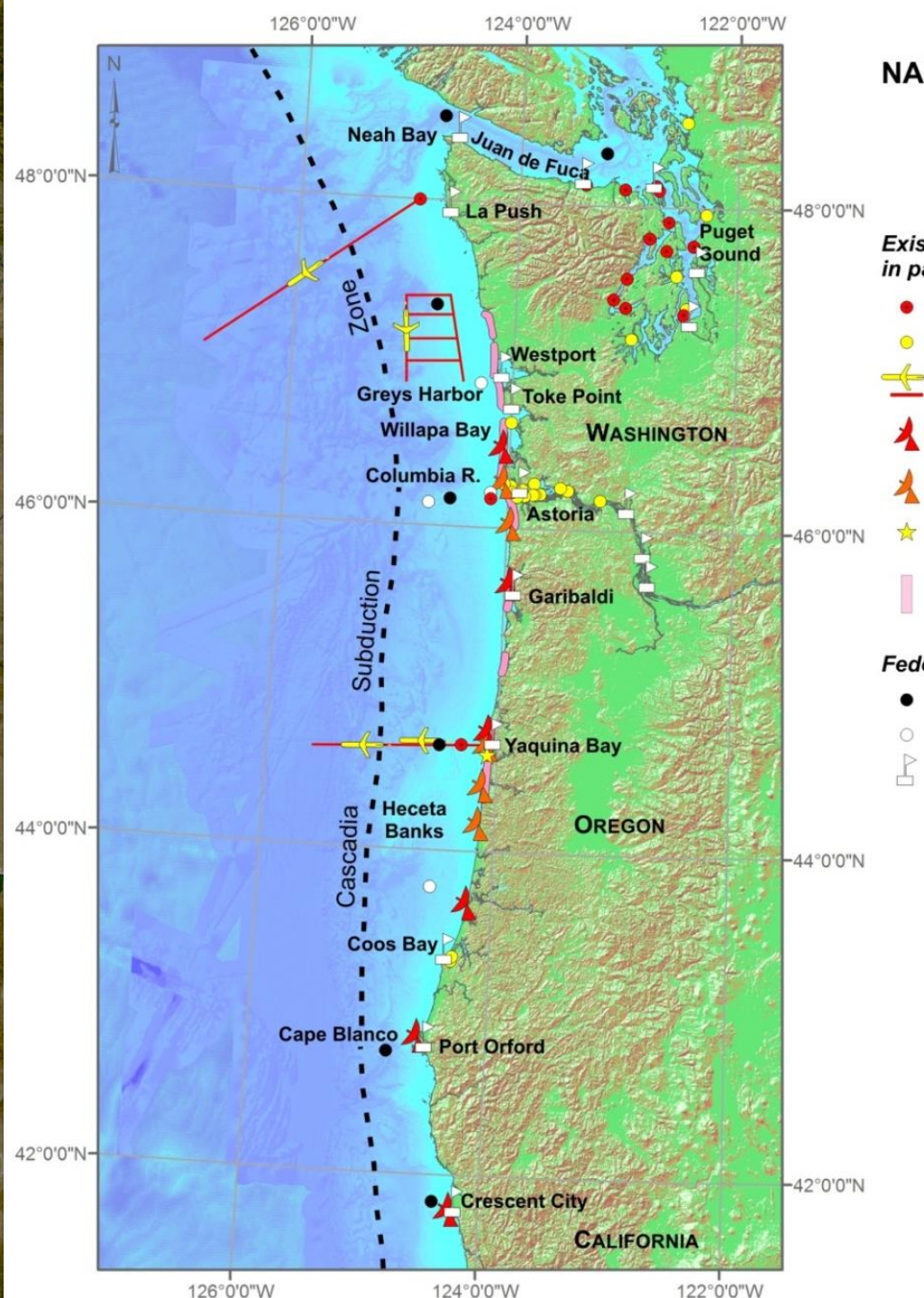
Rocky to sandy, dynamic: storms, erosion
Winds, development, climate

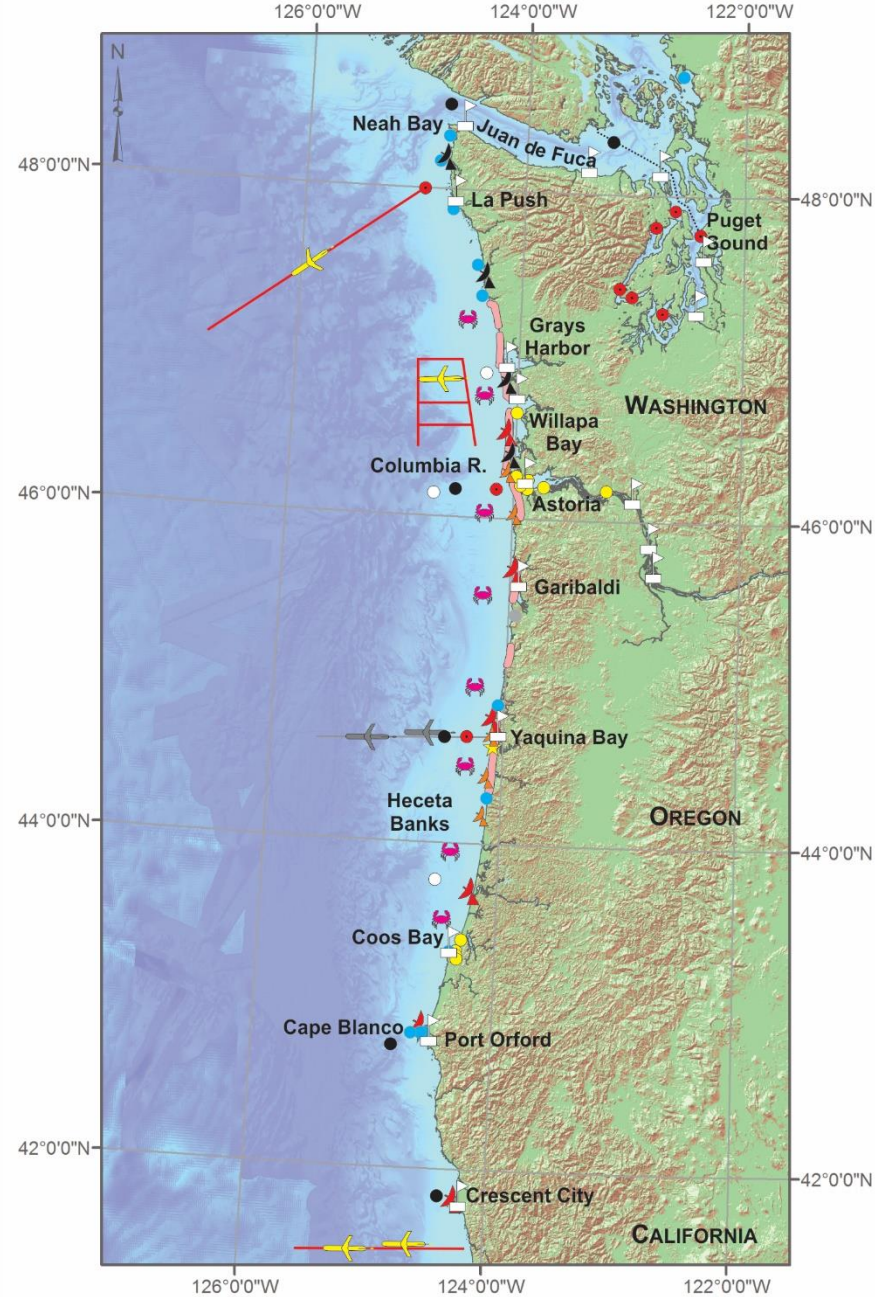
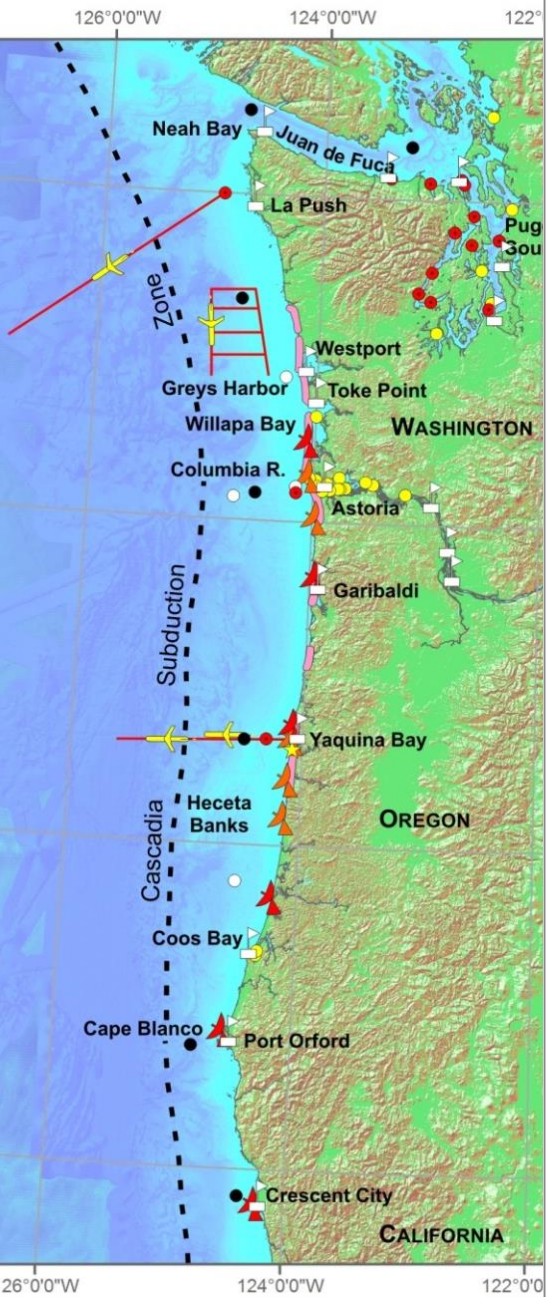
Major rivers:

Columbia River (~75% FW input to Pacific from US WC)
many rivers (e.g., Fraser, Skagit) via Strait Juan de Fuca
Dredging, water regulation, climate change

NANOOS Region User Groups:

Maritime: shipping, oil transport/spill remediation
Fisheries: salmon, shellfish, crab, groundfish, aquaculture
Environmental management: HABs, hypoxia
Shoreline: erosion, inundation
Hazards: Search and rescue, national security
Educators: formal, informal, research
Marine recreation: boating, surfing, diving





NANOOS RCOOS



Existing assets to be sustained in partnership:

- Existing *coastal* and *estuarine* buoys
- Existing fixed mooring *estuarine* buoys
- Existing glider tracks
- Existing long-range (180 km range) HF radar site
- Existing standard-range (50 km range) HF radar site
- ★ Port X-band wave radar
- Beach and shoreline assessment. Includes multiple sites where nearshore bathymetry is being collected
- Puget Sound ferry box
- Existing glider tracks (OOI)

Federal assets:

- NDBC buoys
- CDIP buoys
- NOS Tide gauges

Proposed for new support to be sustained in partnership:

- Proposed long and short-range radar site
- Proposed support for estuarine and nearshore sites
- Crab pot moorings



NANOOS

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WASHINGTON - OREGON - NORTHERN CALIFORNIA

NANOOS remains vital !

“Why is NANOOS so good?”

- The people: creativity
- The spirit: cooperation
- The concept: collaboration

- New capabilities in all sectors



Northwest Association of Networked Ocean Observing Systems
The Integrated Ocean Observing System (IOOS)
Regional Association for the Pacific NW



www.nanoos.org



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5. NANOOS Standing Committees reports



NANOOS

User Products

Jonathan Allan





Why have a NANOOS visualization system?

- **Disparate suite of web sites available to the public** (serving a wide range of data).
- **Regional needs: seamless delivery of coastal, estuarine and ocean data to stakeholders within the NANOOS domain**
(+external partners, other RCOOS, and national/international programs).
- **NANOOS currently provides access to 47 different types of variables, and in total 195 ‘assets’ & 10 model/forecast overlays.**
Effective delivery of these data and product feeds can lead to:
 - **greater situational awareness (local and regional scales);**
 - **improved access to and understanding of environmental variables/conditions; and,**
 - **enable development and access to short- and long-term time-series.**
- Overall goal: to aid our understanding of **climate variability, safety, operations,** and lead to **improved resource management** and **regional productivity.**

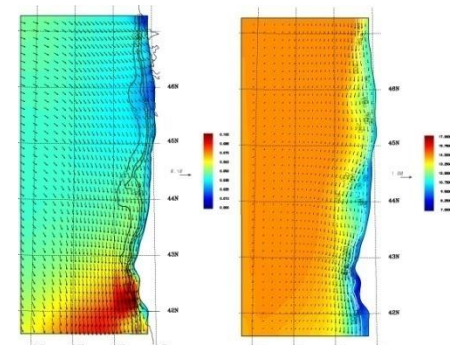
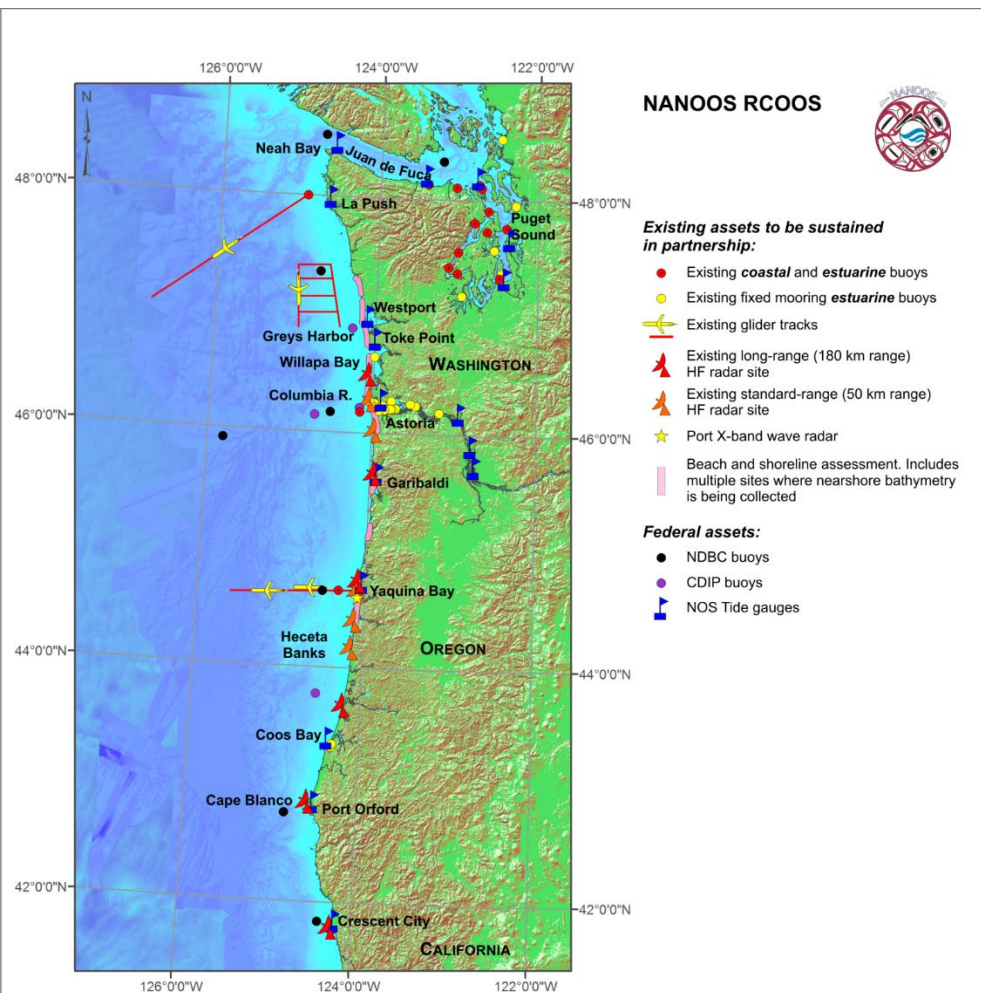


A Challenge - Many Stakeholders

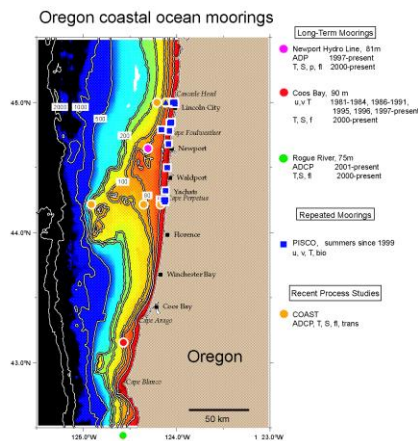
- State agencies (e.g. ODFW, WADOE, DSL, etc.)
- Federal agencies (NOAA, NWS, FEMA, US Coast Guard, etc.)
- Cities and Counties
- Ocean engineering (instruments, wave energy, telecommunication)
- NGO's
- Ports
- Bar pilots
- Fishers (recreational and commercial)
- Shellfish growers
- Recreational boaters
- Tribes
- Geotechnical consultants
- Universities/researchers
- Schools (K-12)
- Public-at-large
- Scientists
- and many others...



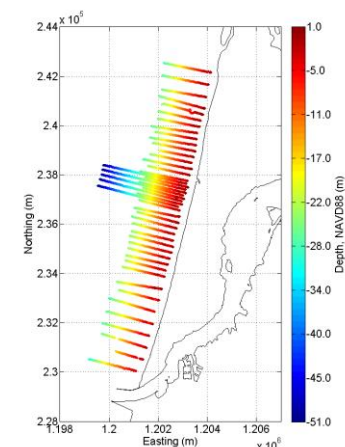
A Challenge - Many Data Types & How to Display Complex Data Effectively



Overlays (Satellite, Models, & other geospatial data)



Shelf moorings & gliders



Shorelines & Bathymetry



NVS History and Status:

Nov. 2009 - v1.0 released

....

May 2010 - v1.6 released (added access to various map image overlays e.g. HF radar, satellite imagery, and ocean models). [v1.0 iPhone NVS mobile app released](#)

....

[Jun 2011 - v. 2.0 iPhone NVS released \(Android Sep 2011\)](#)

Nov 2011 - v2.6 released (Tsunami evacuation zones web app)

Nov 2011 - v. 1.0 iPhone TsunamiNW-Evac app released (Android Jan 2012 – **NOW BROKEN**)

Mar 2013 - v3.0 – Major overhaul of interface; move to Google Maps 3 API; move to dedicated web apps.

Apr 2014 - v3.2 – Major overhaul of NANOOS database and harvesters

....

Oct 2014 – v3.8 – Climatology web app released

Jul 2015 – v4.0 – New timeline, plotting tool, and depth control for overlays released



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Apps Disclaimer Settings Log In

NVS DATA EXPLORER

v4.0 Contact NANOOS

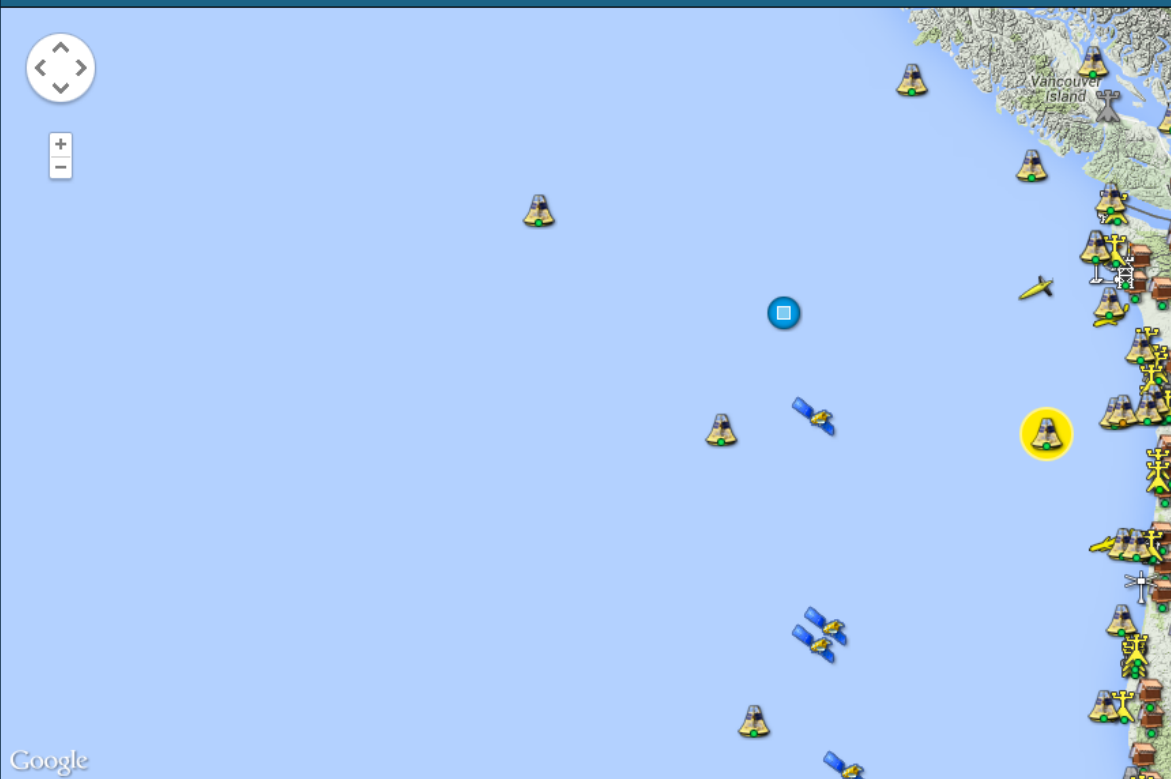
Powered by VIZ

Map Asset List Help

- Map
- Timeline
- Regions
- Filters
- Fixed Platforms
- Mobile Platforms
- Remote Sensing
- Models
- Legend

Lat: 48.8069 Lon: -142.3828

Terrain



NDBC 46089 - Tillamook - 85 NM WNW of Tillamook

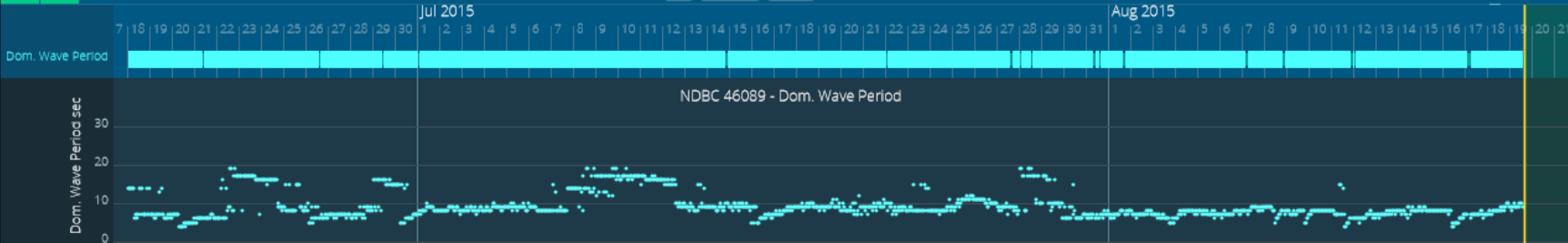
Observations | Forecasts | Comparator | Details | History

Data Updated: 19 Aug 2015 13:50 PDT Provider: NDBC

Air Temperature (13 ft)	65.3 °F	Download	Refresh
Average Wave Period (0 ft)	6.4 sec	Download	Refresh
Barometric Pressure (0 ft)	30 inHg	Download	Refresh
Dominant Wave Period (0 ft)	9 sec	Download	Refresh
Water Temperature (-2 ft)	65.3 °F	Download	Refresh
Wave Height (0 ft)	9.8 ft	Download	Refresh
Wave Mean Direction (0 ft)	337 deg (from)	Download	Refresh
Wind Direction (16 ft)	170 deg (from)	Download	Refresh
Wind Gust (16 ft)	0 knots	Download	Refresh
Wind Speed (16 ft)	0 knots	Download	Refresh

[Link](#)

19 August 2015 3:38 pm PDT





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Map

Asset List

Help

Lat: 42.1797 Lon: -128.5400

Terrain

- Map
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- Mobile Platforms
- Remote Sensing
- Models
- Legend

- Remote Sensing
 - Water Temp. (8 Days)
 - Water Temp. (14 Days)
 - Water Temp. (1 Month)
 - MODIS
 - Chlorophyll (1 Day)
 - Chlorophyll (3 Days)
 - Chlorophyll (8 Days)
 - Chlorophyll (14 Days)
 - Chlorophyll (1 Month)
 - NCDC OI SST
 - Water Temp. (Climate)
 - Water Temp. (Anomaly)
 - OSU AVISO Climate
 - Sea Level (Climate)
 - Sea Level (Anomaly)



NDBC 46050 - Stonewall Bank - 20NM W of Newport

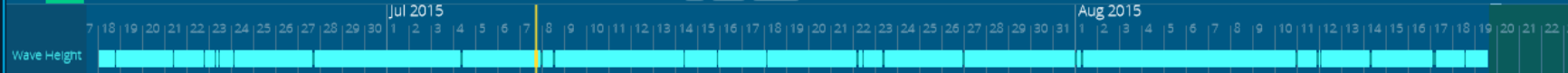
Observations | Forecasts | Comparator | Details | History

Data Updated: 19 Aug 2015 14:50 PDT Provider: NDBC

Air Temperature (4 m)	17.3 °C	↓	↻
Average Wave Period (0 m)	7.7 sec	↓	↻
Barometric Pressure (0 m)	1014.2 mbar	↓	↻
Dominant Wave Period (0 m)	10 sec	↓	↻
Water Temperature (-0.6 m)	17.2 °C	↓	↻
Wave Height (0 m)	2.4 m	↓	↻
Wave Mean Direction (0 m)	335 deg (from)	↓	↻
Wind Direction (5 m)	10 deg (from)	↓	↻
Wind Gust (5 m)	6 m/s	↓	↻
Wind Speed (5 m)	6 m/s	↓	↻

[Link](#)

7 July 2015 5:00 pm PDT





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Apps Disclaimer Settings Log In

NVS DATA EXPLORER

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Map

Asset List

Help

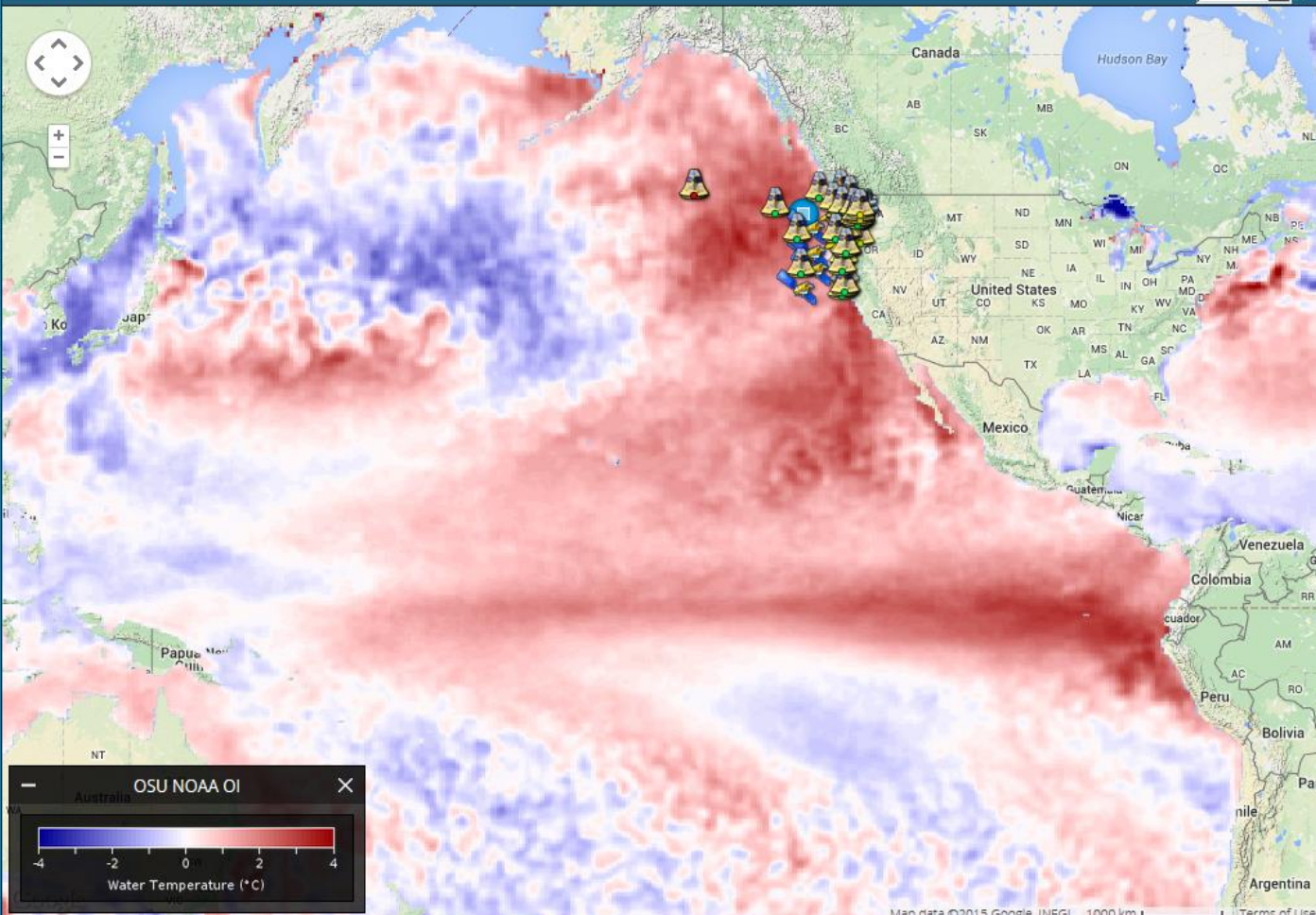
- Map
- Timeline
- Regions
- Filters
- Fixed Platforms
- Mobile Platforms
- Remote Sensing
- Models
- Legend

Remote Sensing

- Water Temp. (1 Month)
- MODIS
- Chlorophyll (1 Day)
- Chlorophyll (3 Days)
- Chlorophyll (8 Days)
- Chlorophyll (14 Days)
- Chlorophyll (1 Month)
- NCDC OI SST
- Water Temp. (Climate)
- Water Temp. (Anomaly)
- OSU AVISO Climate
- Sea Level (Climate)
- Sea Level (Anomaly)
- OSU MODIS Climate
- Chlorophyll (Climate)
- Chlorophyll (Anomaly)
- Water Temp. (Climate)
- Water Temp. (Anomaly)

Lat: 51.0690 Lon: 125.8594

Terrain



16 July 2015 2:00 pm PDT

Map data ©2015 Google, INEGI 1000 km Terms of Use





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Map

Asset List

Help

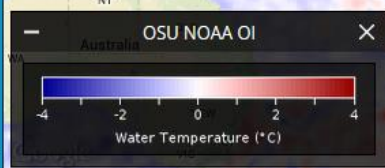
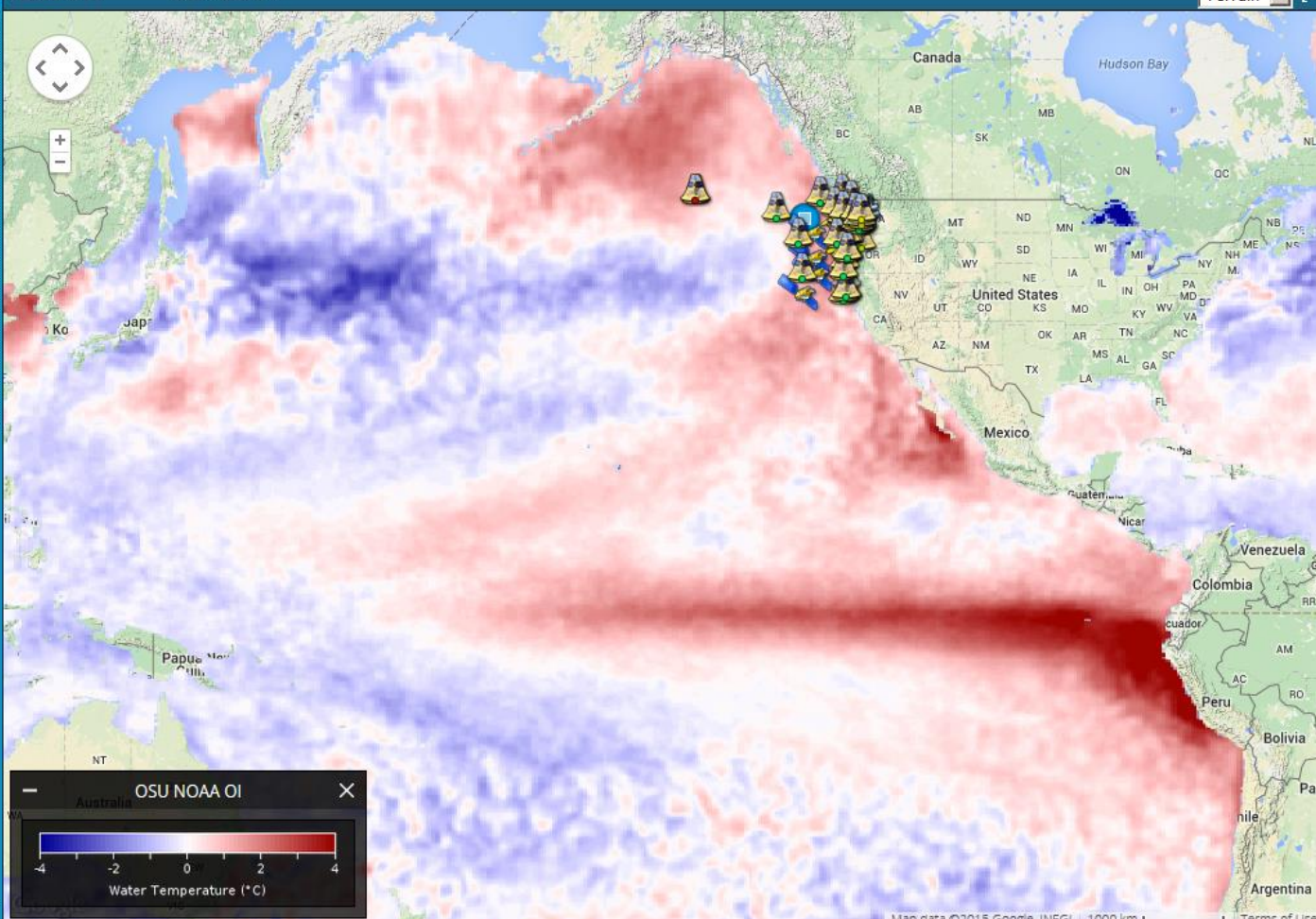
Lat: 44.5905 Lon: 120.7617

Terrain

- Map
- Timeline
- Regions
- Filters
- Fixed Platforms
- Mobile Platforms
- Remote Sensing
- Models
- Legend

Remote Sensing

- Water Temp. (1 Day)
- Water Temp. (1 Month)
- MODIS
- Chlorophyll (1 Day)
- Chlorophyll (3 Days)
- Chlorophyll (8 Days)
- Chlorophyll (14 Days)
- Chlorophyll (1 Month)
- NCDC OI SST
- Water Temp. (Climate)
- Water Temp. (Anomaly)
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- Sea Level (Climate)
- Sea Level (Anomaly)
- OSU MODIS Climate
- Chlorophyll (Climate)
- Chlorophyll (Anomaly)
- Water Temp. (Climate)
- Water Temp. (Anomaly)



9 July 1997 6:00 am PDT





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Map Asset List Help

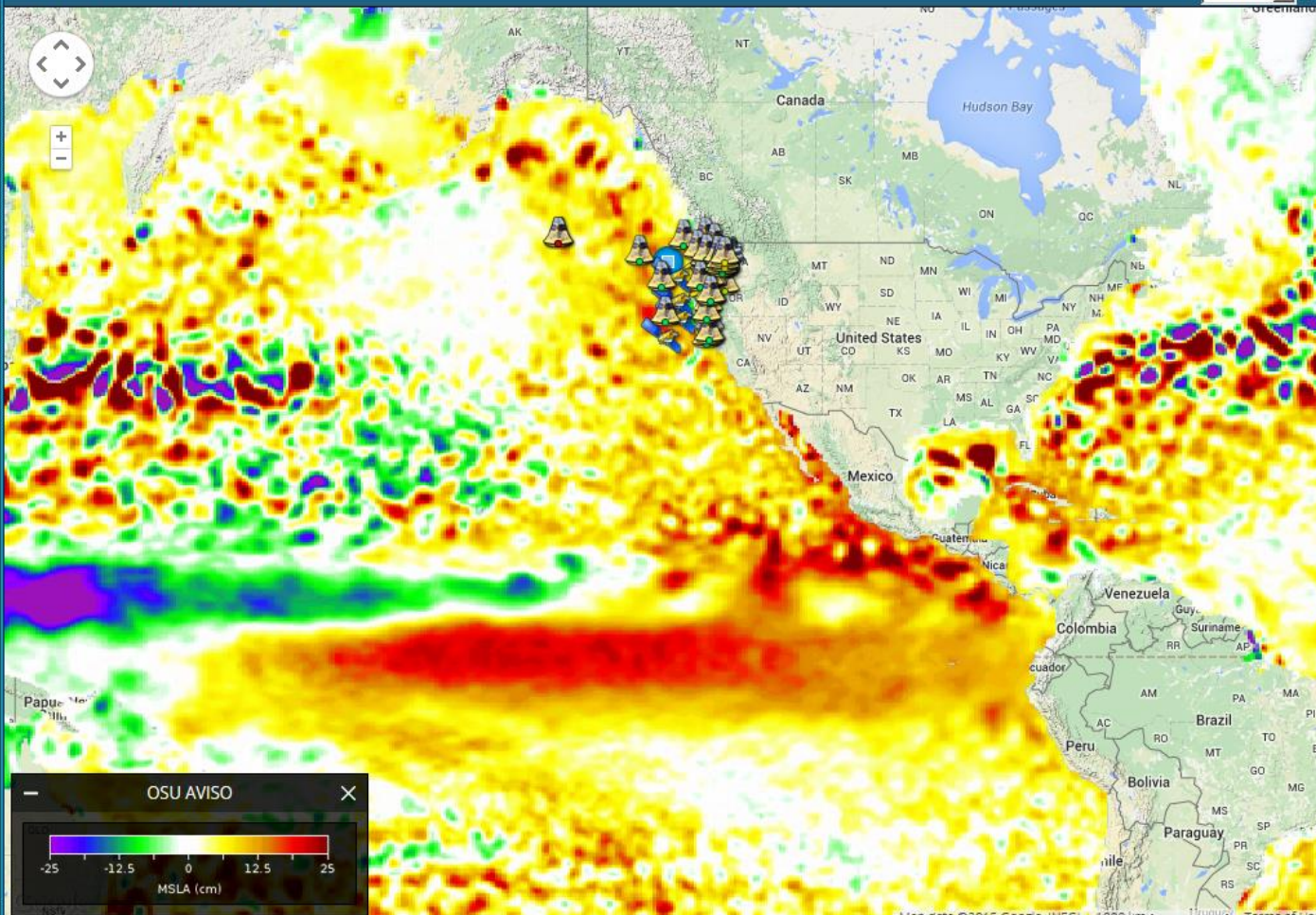
Lat: 63.9374 Lon: -172.6172

Terrain

- Map
- Timeline
- Regions
- Filters
- Fixed Platforms
- Mobile Platforms
- Remote Sensing
- Models
- Legend

Remote Sensing

- Water Temp. (1 Month)
- MODIS
 - Chlorophyll (1 Day)
 - Chlorophyll (3 Days)
 - Chlorophyll (8 Days)
 - Chlorophyll (14 Days)
 - Chlorophyll (1 Month)
- NCDC OI SST
 - Water Temp. (Climate)
 - Water Temp. (Anomaly)
- OSU AVISO Climate
 - Sea Level (Climate)
 - Sea Level (Anomaly)
- OSU MODIS Climate
 - Chlorophyll (Climate)
 - Chlorophyll (Anomaly)
 - Water Temp. (Climate)
 - Water Temp. (Anomaly)



7 July 2015 5:00 pm PDT





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Map Asset List Help

- Map
- Timeline
- Regions
- Filters
- Fixed Platforms
- Mobile Platforms
- Remote Sensing
- Models
- Legend

Lat: 46.2867 Lon: -124.0162

Terrain

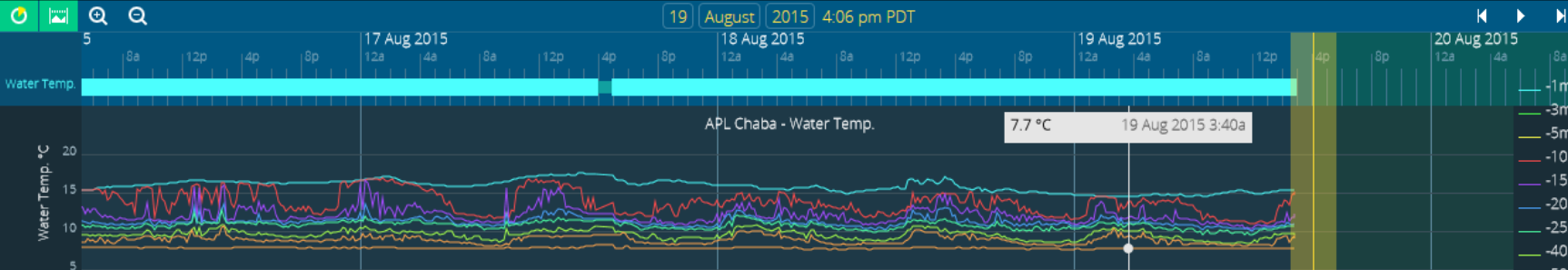


Chá?ba- UW/NANOOS Moored Buoy near La Push

Observations Forecasts Comparator Details History Credits

● (-84 m)	33.5 PSU
● Turbidity (-3 m)	0.2 NTU
Water Temperature	
● (-1 m)	15.3 °C
● (-3 m)	12.6 °C
● (-5 m)	10.6 °C
● (-10 m)	14.7 °C
● (-15 m)	12.3 °C
● (-20 m)	11 °C
● (-25 m)	10.6 °C
● (-40 m)	9.5 °C
● (-50 m)	9 °C
● (-60 m)	7.4 °C
● (-84 m)	7.8 °C
● Wind Direction (3.7 m)	308.8 deg (from)
● Wind Speed (3.7 m)	5.1 m/s

Link





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Apps Disclaimer Settings Log In

NVS CLIMATOLOGY

v4.0 Contact NANOOS

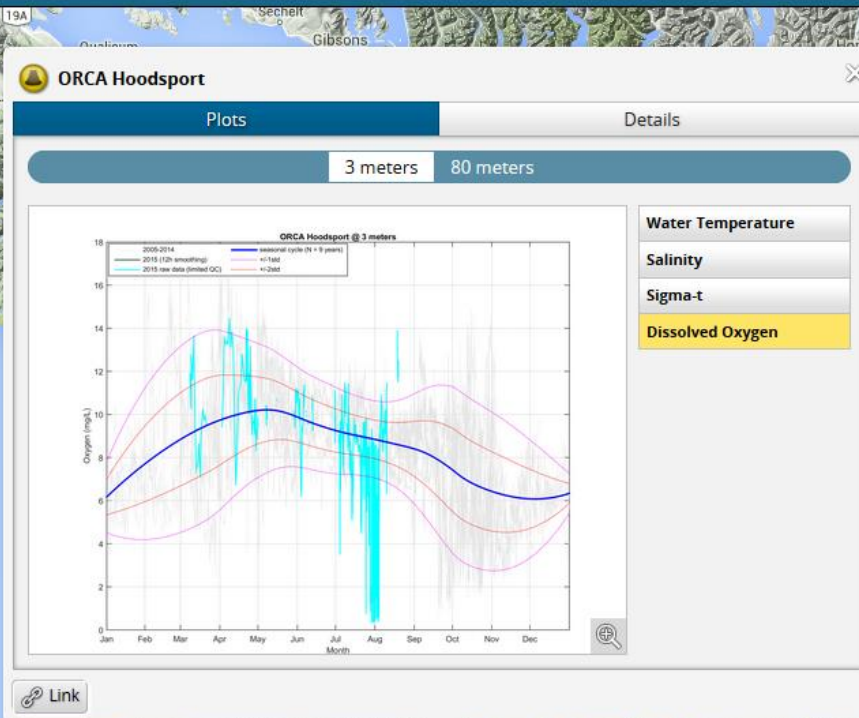
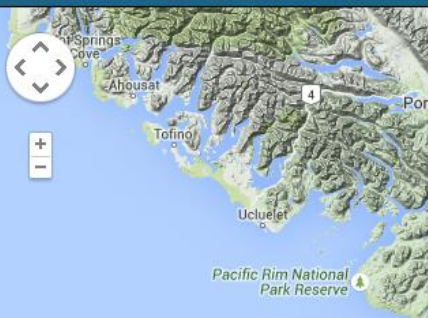
Powered by Vizeer

Map Overview Help

Terrain

Lat: 49.4396 Lon: -124.1345

- Map
- Timeline
- Regions
- Sites
- Models
- Remote Sensing
- Legend



Google

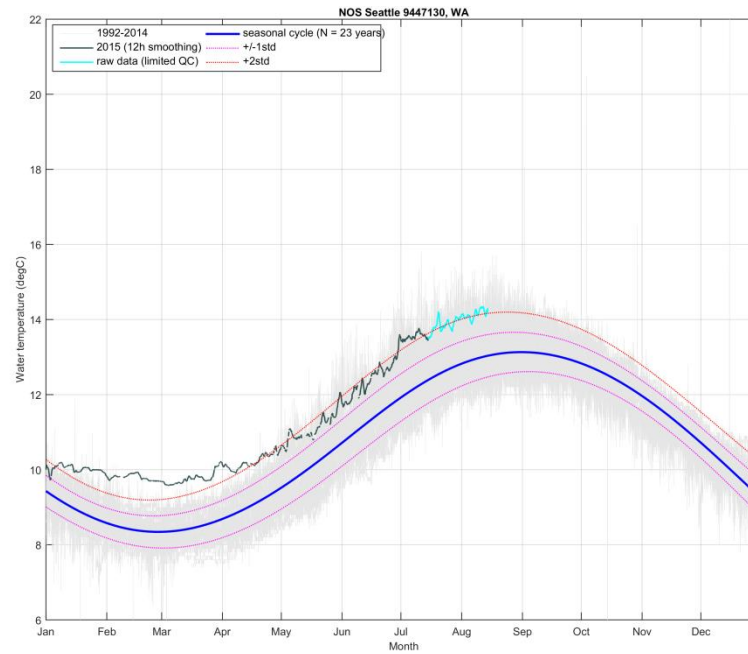
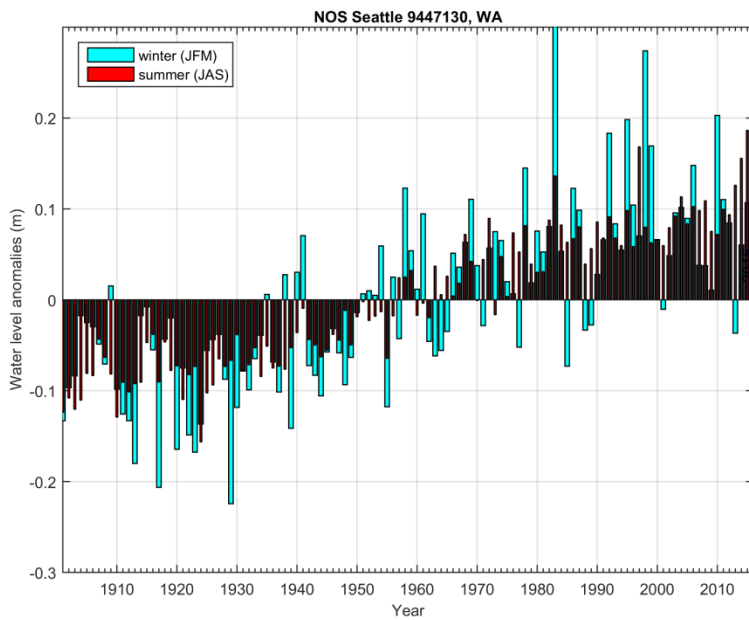


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Questions?





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NANOOS
Data Management and
Communications (DMAC)
presentation to NANOOS Principal
Investigators & Governing Council
August 20, 2015

NANOOS DMAC chair:

Emilio Mayorga – UW

Presenter:

Troy Tanner – UW



“New” NANOOS DMAC Focus Team:

Emilio Mayorga – UW/APL, Chair

Craig Risien – OSU

Charles Seaton – OHSU/CMOP

*Still part of broader DMAC-UPC-Web-Outreach team, as before.
But now with focused interactions to give sustained attention to
“low-level” DMAC issues and IOOS DMAC compliance.*

- ◆ Close interactions with: Jon Allan (DOGAMI) & Troy Tanner (UW/APL)
- ◆ Also: Alex Dioso & Sky Bradley – UW/APL (System Administration, software development support); Boeing (thru 2015-5); and others, ad hoc.



DMAC Events, Broader engagement

- Monthly NANOOS DMAC calls (Emilio, Craig & Charles)
- Annual NANOOS DMAC-UPC meeting (April 2015, Seattle)
- IOOS DMAC Workshop (May 2015)
- Community engagement:
 - WCGA Ocean Data Network meeting (Craig & Emilio, Nov. 2014)
 - Tools for Modeling, Forecasting & Managing for *Vibrio* spp. in WA (Emilio, Apr. 2015)
 - NSF EarthCube CyberInfrastructure Technical Meeting (Emilio, Apr. 2015)
 - Pacific Anomalies Science & Technology Workshop (Craig, May 2015)
 - Global Ocean Acidification Observation Network, Data Portal Meeting (Emilio, June 2015)
 - OOI (Craig, all the time)



New Data Streams and Data Products

1. New or enhanced near-real-time in-situ assets. Highlights: Collaborative tribal-NERR site in Coos Bay, OR. * New network of 15 WADOH air temperature & water temp. + conductivity sites. * UW Friday Harbor sensors at Penn Cove Shellfish platform. * New pH sensors at UW La Push (ChaBa), UW ORCA Carr Inlet, and NDBC Cape Elizabeth. *Burkolator OA sensor packages at 3 existing shellfish growers' sites. * 3 CMOP-OHSU SATURN sites. * *Coming soon: New site at Quilcene Bay (Penn Cove Shellfish + WA DNR + UW Friday Harbor).*

2. Model forecasts. UW “LiveOcean” Salish Sea with multi-depth output and soon OA variables.

3. Climatologies & anomalies. In-situ stations (NDBC, C-MAN, UW ORCA). AVISO remote sensing mean-sea-level, NCDC Optimum Interpolation SST, NCEP NARR model reanalysis winds, and World Ocean Atlas salinity; including regular updates to these and other monthly anomalies.

And ongoing redeployments and refinements to existing assets, data streams



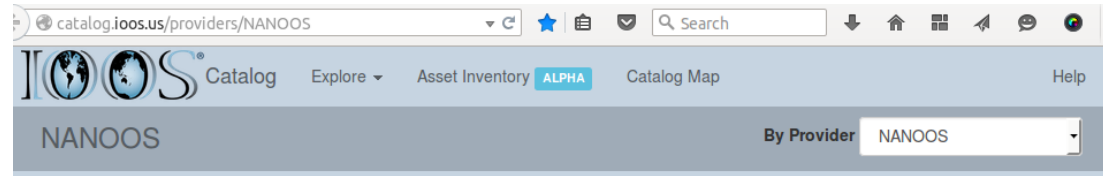
NANOOS DMAC presence

- NVS!
- *Delayed, but soon:* New NANOOS DMAC page in NANOOS portal
 - To describe our activities and resources, for use by more technical users
- Centralized services: <http://data.nanoos.org>. Consistent, stable organization of web services for programmatic access
 - <http://data.nanoos.org/52nsos/sos>
 - <http://data.nanoos.org/geoserver>
 - <http://data.nanoos.org/metadata>
 - *More coming, including more user friendly presentations*
- Distributed services: Compliant THREDDS services at OSU and OHSU/CMOP. Currently only model output, but will expand to in-situ observations.
- At National & Regional Catalogs, Resources
 - **IOOS Registry & Catalog**
 - NOAA SWFSC CoastWatch ERDDAP
 - NDBC
 - WCGA Ocean Data Portal catalog
 - IPACOA



IOOS Catalog – <http://catalog.ioos.us>

- ◆ Expanding, improved NANOOS registration of IOOS DMAC compliant data services for **observations** (“NVS-based” SOS service, at UW/APL), **models** (OSU ROMS model and CMOP SELFE model, at OSU & CMOP THREDDS servers), and **climatologies/anomalies** (OSU/NOAA SWFSC).
- ◆ Glider DAC (OSU NANOOS-CeNCOOS glider; CMOP glider).
- ◆ Improved metadata.



Northwest Association of Networked Ocean Observing Systems

The Northwest Association of Networked Ocean Observing Systems (NANOOS) is the Regional Association of the national Integrated Ocean Observing System (IOOS) in the Pacific Northwest, primarily Washington and Oregon. NANOOS has strong ties with the observing programs in Alaska and British Columbia through our common purpose and the occasional overlap of data and products.

External Links
NANOOS Site http://www.nanoos.org
NANOOS Visualization System (NVS) http://nvs.nanoos.org

NANOOS has 12 services over 4 servers producing 66 datasets.

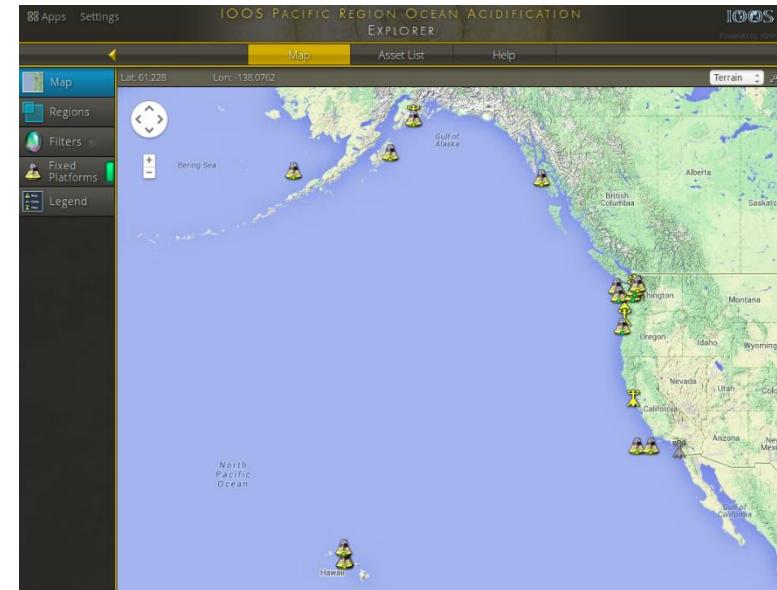
[🔍 Explore Services](#)

[🔍 Explore Datasets](#)



Ocean Acidification Data Activities

- ◆ IPACOA (<http://www.ipacoa.org>)
 - ◆ Released Nov. 2014. Jan will say a lot more about it! “Burkolators”, PMEL MAPCO2, some NANOOS OA assets.
 - ◆ IPACOA enhancements to data offerings starting soon.
 - ◆ Close engagement and technical support, collaboration, with SCCOOS, CeNCOOS, AOOS.
- ◆ Ongoing support for OA monitoring in **NANOOS region**.
- ◆ Possible NANOOS role in **international** (“GOA-ON”): future, global adaptation of IPACOA approach, tools.





WCGA – West Coast Ocean Data Network (WCODN)

- Ocean Data Network, Portal (<http://portal.westcoastoceans.org>) and Map Viewer: Continued technical guidance & collaboration, including assistance to WC RA's
- NANOOS & WC RA data & data service registration
- Participation in WCODN annual meeting
- “GIS” web service support for RA-derived ocean data
- Laura Lilly, WCGA – WC RA's SeaGrant Fellow (ended Nov. 2014)
 - Emilio was technical supervisor; Julie Thomas (SCCOOS Director) overall supervisor; Todd Hallenbeck WCGA supervisor
 - Ocean Acidification & Marine Debris focus
 - Ocean data products (from HF surface currents, etc)
 - Gained experience supporting WC MSP community, working together closely with WCODN, CeNCOOS & SCCOOS



WEST COAST OCEAN DATA PORTAL

DISCOVER

CONNECT

INFORM

VISUALIZE

ABOUT

SHOW ▾

NANOOS



5 results found for NANOOS ✕.

Location >

Categories >

Issues >

Formats >

Sources >

NANOOS VISUALIZATION SYSTEM (NVS)

NVS (NANOOS Visualization System) is a web application that provi...

[METADATA XML](#) ⓘ
[JSON](#) ⓘ

ROMS MODELED OCEAN SURFACE CURRENTS - OSU (OREGON COAST)

Experimental nowcast and forecast fields showing Oregon coastal ...

[METADATA XML](#) ⓘ
[JSON](#) ⓘ

UCSC CALIFORNIA CURRENT SYSTEM ROMS NOWCAST 10KM

This West Coast ROMS model is one of two near real-time ocean ...

[OPEN](#) ⓘ
[OGC WMS](#) ⓘ
[METADATA XML](#) ⓘ
[JSON](#) ⓘ

WEST COAST OCEAN ACIDIFICATION

[OGC WMS](#) ⓘ
[OGC WFS](#) ⓘ



Expanding DMAC capabilities, compliance

- **Ongoing enhancements to NANOOS web services, registration with IOOS Catalog.** Expand integration of observation data, models, data products (climatologies).
- **Long time series.** Ongoing pilot work (OSU, CMOP). *Goal to make data available via IOOS DMAC services and accessible to NVS (new NVS time series plotter, time slider).* Substantial progress planned for FY 2015.
- **Data Archiving with NCEI (“NODC”).** Pilot project with CMOP.
- **Glider data:**
 - Started inventorying and documentation of NANOOS supported glider deployments, data, current data flows/procedures. All glider operators.
 - Developing NANOOS experience for **Glider DAC** submission: New CMOP submission procedures (historical and upcoming deployments); CeNCOOS submission of OSU glider deployment.
 - Distribution via IOOS DMAC services, accessibility to NVS as standardized data.
- **QARTOD near-real-time QA/QC.** Ongoing participation in IOOS QARTOD webinars, discussions. Emilio is in 2 QARTOD committees. Will pursue initial pilots.



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NANOOS Education & Outreach Update

NANOOS Joint PI and Governing Council Meeting
August 21, 2015

Amy Sprenger, Education & Outreach Coordinator
Rachel Vander Giessen, Outreach Specialist



Scope of Work

Product Development	Work with DMAC and User Products Committees on tailored product development, increase usability of NVS
User Engagement	Conduct outreach and trainings to select user groups as resources permit
Networking	Maintain existing and build new relationships with NANOOS priority area users and the education community



Scope of Work

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- Through weekly tag-ups, we have consistently provided input on usability of NANOOS products



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Networking	Maintain existing and build new relationships with NANOOS priority area users and the education community

- Throughout past year, we have provided outreach to a variety of user groups and also to the public at large using social media



Scope of Work

Product Development	Work with DMAC and User Products Committees on tailored product development, increase usability of NVS
User Engagement	Conduct outreach and trainings to select user groups as resources permit
Networking	Maintain existing and build new relationships with NANOOS priority area users and the education community

- NANOOS is well-regarded in PNW education community; now we are sought after, for our participation, instead of us seeking involvement



Education:

NANOOS goal remains increasing ocean literacy

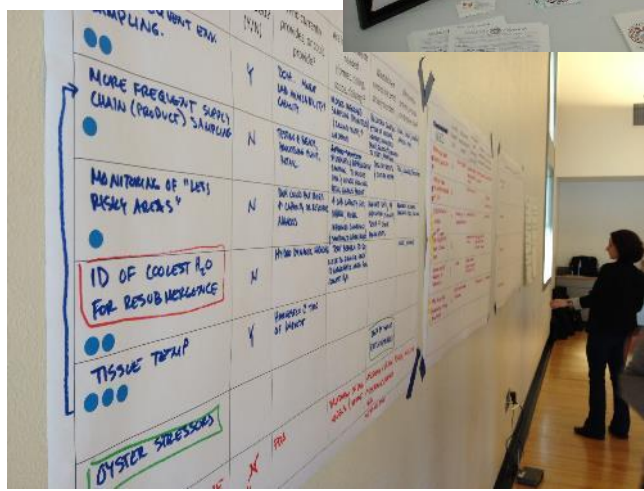


- NW Aquatic & Marine Educators Conferences
- Classroom Visits
- Educators and UG students on OA & Buoy cruises
- “Finding a Story in Data” Teacher Workshops
- MS & HS Summer Science Camps
- Outreach @ informal learning centers

Outreach: targeted user groups

NANOOS goal to link user groups with data products

- NW Marine Tech Summit
- EcoBuilding Conference
- Pacific Coast Shellfish Growers Association Meeting
- Pacific Rim Shellfish Sanitation Conference
- Science Inside Out 2015
- *Vibrio* Forecasting workshop
- Marine Managers workshop
- OA talks to librarians, resource managers, etc.





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Outreach: science

Bringing NANOOS to scientists, policy makers and the general public



Mission

The U.S. coastal Integrated Ocean Observing System (IOOS) is a regionally coordinated, multi-scale system, and network-based "ecosystem" of the National Weather Service. It provides and enhances our nation's access to data from the coastal oceans, and estuaries. NANOOS is one of seven IOOS regional associations serving Washington and Oregon. It coordinates and supports the development, implementation, and operation of Pacific Northwest coastal ocean observing systems providing ocean data and data products to diverse end users in a timely fashion in customized ways to meet their needs.

NANOOS is a growing partnership of over 50 entities in the PNW — industry, tribes, state agencies, local governments, non-governmental organizations, and educational and research institutions. NANOOS' core function and vision is to foster connectivity of groups with specific interests (e.g., fisheries, education, environmental health and safety groups, and recreational boaters).

IOOS addresses U.S. state and territory ecosystems. Federally authorized in 2009 by the IOOS Act, IOOS is administered by NOAA. The NOAA leads NANOOS implementation IOOS regionally through its diverse partnerships supporting the IOOS citizen, conference, and economy.

Focus

Regional stakeholders identified their high priority areas:

Maritime Operations • Coastal Hazards • Fisheries • Ecosystem Assessment • Climate & Weather

To address these, NANOOS enables observing and modeling of forces, and provides the public access to observational data, model forecasts, decision-making tools, and new applications for regional coastal science, education, and research.

Sustaining NANOOS

Investments in NANOOS have resulted in additional high-technology ships, better real-time datasets, and new resources. Increased high-resolution, real-time, resource management, and other capabilities are dependent on NANOOS' high-quality data and data products, as well as forecasts.

NANOOS has the basic observing infrastructure, data analysis and delivery systems, and human resources to make a difference in the PNW. The NANOOS Visualization System allows data users from a wide variety of resources, using educational tools and easy-to-use, user-friendly, and customized presentation based on community feedback. The product is viewed over 2,000 times a month.

Increasing Data Delivery & Efficiency

The NANOOS Visualization System (NVS) is an online portal that gives easy access to real-time observations and forecasts as well as historical and broader context from a wide range of ocean observational assets and from many disciplines, including local, state, federal and tribal agencies, academia, and private industry. NVS provides user-friendly data display, sophisticated yet accessible capabilities such as comparison of forecasts with real-time observations, and customized presentation based on community feedback. The product is viewed over 2,000 times a month.



- Eastern Pacific Ocean Conference
- Pacific Anomalies workshop
- PS Marine Waters Overview 2014
- Hill visits with NANOOS updates
- Field day with Congressional staffers
- Puget Sound Awareness media event
- Seattle Girls School
- SoundWaters seminar
- public forums





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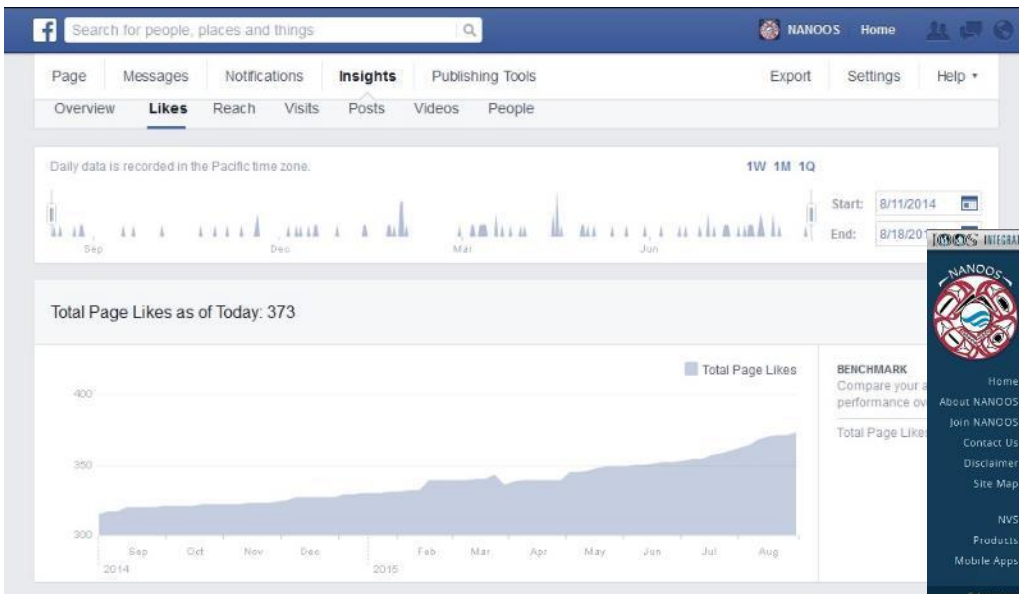
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Outreach: public

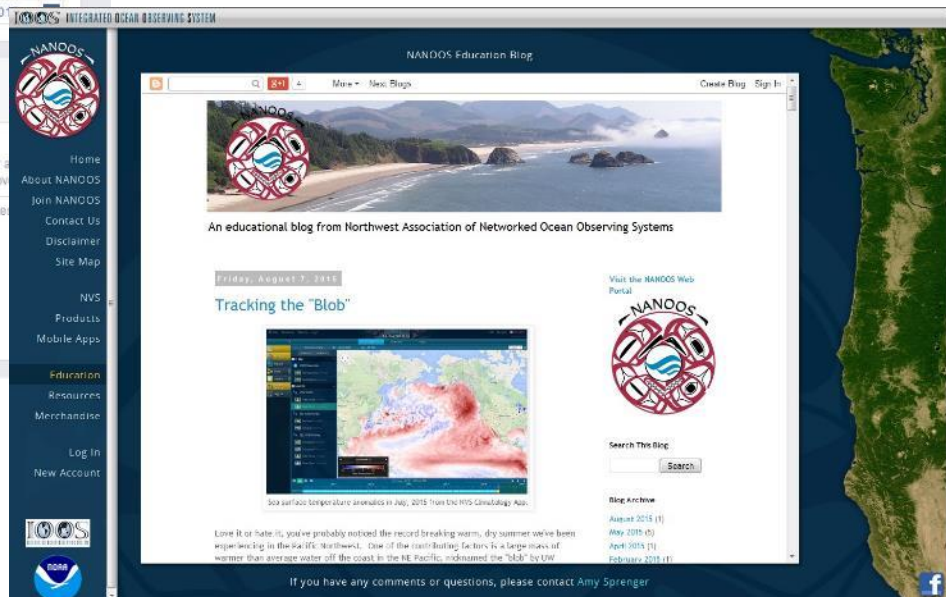
Utilizing social media

Facebook: <https://www.facebook.com/NANOOS.PNW>

Twitter:
[@nanoos_pnw](https://twitter.com/nanoos_pnw)



NANOOS Blog on Education page





Plan for Y10

Stay the course!

Education Efforts

- Continue to support NANOOS education partners
- Continue to support student built buoy and similar STEM projects

Outreach Efforts

- Continue to assist with development of web and mobile apps
- Continue outreach to current users groups, adding maritime ops & recreational boaters communities



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6. GC Business

2012-16 NANOOS GC Board

Academic:

- David Martin, Governing Council Board Member for UW
- Mike Kosro, Governing Council Board Member for OSU
- Antonio Baptista, Governing Council Board Member for OHSU

State:

- Carol Maloy, Governing Council Board Member for Washington State Agencies
- [Vicki McConnell, Governing Council Board Member for Oregon State Agencies](#)

Tribes:

- Paul McCollum, Governing Council Board Member for Tribes
- Joe Schumacker, Governing Council Board Member for Tribes

Federal:

- John Stein, Governing Council Board Member for Washington Federal Offices
- Andy Lanier, Acting Member, Governing Council Board Member for Oregon Federal Offices

Industry:

- Casey Moore, Governing Council Board Member for Industry
- [Steve Uczekaj, Governing Council Board Member for Industry](#)

NGO:

- Fritz Stahr, Governing Council Board Member for Non-Governmental Organizations
- [Jody Kennedy, Governing Council Board Member for Non-Governmental Organizations](#)

At Large:

- [Rich Chwaszczewski, Governing Council Board Member At-Large](#)
- Chris Mooers, Governing Council Board Member At-Large

2012-16 NANOOS GC Board

Academic:

- David Martin, Governing Council Board Member for UW
- Mike Kosro, Governing Council Board Member for OSU
- Antonio Baptista, Governing Council Board Member for OHSU

State:

- Carol Maloy, Governing Council Board Member for Washington State Agencies
- **Jon Allan, DOGAMI, Acting** Governing Council Board Member for Oregon State Agencies

Tribes:

- Paul McCollum, Governing Council Board Member for Tribes
- Joe Schumacker, Governing Council Board Member for Tribes

Federal:

- John Stein, Governing Council Board Member for Washington Federal Offices
- Andy Lanier, **Acting** Governing Council Board Member for Oregon Federal Offices

Industry:

- Casey Moore, **SeaBird Scientific**, Governing Council Board Member for Industry
- **Andrew Barnard, WetLabs, Acting** Governing Council Board Member for Industry

NGO:

- Fritz Stahr, Governing Council Board Member for Non-Governmental Organizations
- **Paul Dye, TNC, Acting** Governing Council Board Member for Non-Governmental Organizations

At Large:

- **Vacant**, Governing Council Board Member At-Large
- Chris Mooers, Governing Council Board Member At-Large



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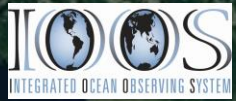
NANOOS business

- Fill vacant seats on NANOOS GC Board
 - Volunteers self identify; opportunity will be advertised; ballot distributed
- Identify how NANOOS pays annual \$500 non-federal dues to IOOS Association
 - Volunteers self identify; opportunity will be advertised to industry & NGO members



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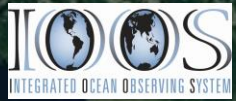
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7. Round Table for announcements from GC members



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8. Wrap-up, Action Item review, and Adjourn