

Sustaining NANOOS, the Pacific Northwest component of the US IOOS

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LONG-TERM GOALS

Our goal is to sustain, and, depending on funding, enhance the Northwest Association of Networked Ocean Observing Systems (NANOOS), the Pacific Northwest Regional Coastal Ocean Observing System (RCOOS) that serves regional stakeholders in alignment with the vision of the U.S. Integrated Ocean Observing System (IOOS). NANOOS seeks to maintain the integrated in-water and land-based observing systems, data management and communications, analyses and products, and education and outreach subsystems that it has developed, implemented, and integrated with NOAA IOOS and substantial leveraged funding. NANOOS will remain focused on delivering to diverse stakeholders data-based products and services that are easy to use, to address high-priority issues and aid decision-making. NANOOS will continue its proactive interactions with a wide range of PNW stakeholders, to prioritize and refine our observations, products, and outreach efforts.

OBJECTIVES

For FY11 (= Y1 of NOPP award = Y5 of NANOOS RCOOS), our specific objectives are to:

- 1) Maintain NANOOS as the PNW IOOS Regional Association. Sustain our proven role for regional coordination, administrative infrastructure, and stakeholder engagement.
- 2) Maintain surface current and wave mapping capability. Maintain existing HF-radar foundational capability, providing a portion of critical national capacity, and continue investment in wave mapping at a critical port.
- 3) Sustain existing buoys and gliders (with reduced glider deployment in WA) in the PNW coastal ocean, in coordination with national programs. Maintain these essential assets providing regional observations, with focus on hypoxia, HABS, ocean acidification, climate change detection and modeling input.
- 4) Maintain observation capabilities in PNW estuaries, in coordination with local and regional programs. Maintain these to aid sustainable resource management, water quality assessment and sub-regional climate change evaluation, with high priority new feeds.
- 5) Maintain core elements of beach and shoreline observing programs. Contribute to hazard mitigation by providing essential observations and decision support tools for coastal managers, planners and engineers, as resources allow.
- 6) Maintain NANOOS' Data Management and Communications (DMAC) system for routine operational distribution of data and information. Sustain, as feasible, the DMAC system NANOOS has built, including the NANOOS Visualization System (NVS), for dynamic and distributed data access and visualization for IOOS.
- 7) Contribute to a community of complementary numerical regional models. Contribute to the operation of regional models, and the tools and products they support, covering the head of tide of estuaries to the outer edges of the EEZ in both OR and WA.

8) Deliver existing user-defined products and services for PNW stakeholders. Continue to provide to succeed in this vital translation: meaningful and informative data products that will connect with user applications and serve society.

9) Sustain NANOOS education and outreach efforts. Foster ocean literacy and facilitate use of NANOOS products for IOOS objectives, the core task for which the entire NANOOS RCOOS is constructed, via existing approaches for engaging users.

APPROACH AND WORK PLAN

Appropriate details of our Approach and Work Plan for the NANOOS Regional Coastal Ocean Observing System (RCOOS) were given in our project proposal and revised work plan and milestones on record at the NOAA IOOS Program Office. Only highlights are given here for the five primary functions of NANOOS.

The University of Washington (UW) is the legal fiscal representative for this project. Co-PIs Martin (NANOOS Board Chair, UW) and Newton (NANOOS Executive Director, UW) oversee sustained management, development, and operation of NANOOS in accordance with IOOS principles and according to the objectives of this project. For some of the work, sub-contracts are made to partner PIs at Oregon State University (OSU), Oregon Health and Sciences University (OHSU), The Boeing Company (Boeing), Washington Dept Ecology (Ecology), Oregon Dept of Geology and Minerals Industries (DOGAMI), and the Oregon Dept of State Lands (ODSL).

1) Coordinated Regional Management for the PNW: NANOOS will sustain our proven capacity for regional coordination, administrative infrastructure, and stakeholder engagement and maintain its role as the US IOOS Regional Association for the PNW. We will sustain management of NANOOS to continue its successful 5-y old governance structure, codified by our MOA, comprised of: 1) a decision-making Governing Council (GC) of representatives from member (MOA-signatory) institutions; 2) an Executive Committee to serve the GC's needs, composed of elected GC Board members (with sector representation from federal, state and local agencies, tribes, academia, industry, and NGOs) and NANOOS operational committee chairs; 3) a Board Chair and Vice Chair for leadership; 4) an Executive Director for project oversight; and 5) distributed partner PIs who execute the subsystems of the NANOOS RCOOS. Annual GC meetings are used to identify priorities, new members, and deficiencies for the NANOOS enterprise. The ExCom is consulted when decision-making issues arise.

Martin and Newton will assure that NANOOS continues to participate actively with NFRA and US IOOS, attending NFRA Board and IOOS Regional Coordination meetings. Through their efforts, NANOOS will submit required IOOS progress reports, assessments, and performance metrics and will seek certification as a member of US IOOS once certification standards and processes are determined.

2) Observing Subsystem: NANOOS will sustain observing assets within four observational domains: coastal ocean surface currents/waves, coastal ocean shelf, estuaries, and shorelines according to our RCOOS Conceptual Design (Fig. 1). These assets collectively address NANOOS' four priority topical areas and feed data product development for each. NANOOS has emphasized both real-time and time-series observing, the latter critical to our capability to evaluate climate change. These assets are operated by the investigator and institution indicated in parentheses. Funding from this NOPP award

covers only a fraction of operational costs, so all assets are highly leveraged. All will deliver resultant datastreams via the NANOOS Visualization System (NVS).

Coastal Ocean Surface Currents: Maintain several OR HF radar sites (Kosro, OSU) and one X-band radar site (Haller, OSU).

Coastal Ocean Shelf: Maintain buoys at La Push, WA (Alford, UW), Newport, OR (Levine, OSU) and Columbia R. (Baptista, OHSU). Maintain WA (Alford, UW) and OR (Barth, OSU) glider transects, as possible at current funding level.

Estuaries: Maintain Puget Sound (Devol, UW), Columbia R. (Baptista, OHSU), Willapa (Maloy, Ecology) and South Slough (Rumrill, ODSL) moorings.

Shorelines: Maintain shoreline observations in WA (Kaminsky, Ecology) and OR (Allan, DOGAMI) and deliver these datastreams via the NVS

3) Data Management and Communications (DMAC) subsystem: NANOOS will continue its ongoing DMAC collaboration for a sustainable system providing IOOS standards-based data products, tools and services to local, regional and national users. We focus on both a robust DMAC Information System and an informative Web and User Products capacity. We work closely with other RAs and IOOS to leverage ongoing work and contribute to the definition and implementation of a consistent set of certification criteria following guidelines set forth in the IOOS DMAC implementation document. NANOOS DMAC is conducted by a highly collaborative industry-university-agency team: Uczekaj (Boeing Research and Technology), Jones/Mayorga (UW), Batista (OHSU), Kosro (OSU), and Allan (DOGAMI).

Our approach for developing DMAC information system capabilities meeting overall IOOS goals and objectives includes efforts in: Data Discovery and Regional Coordination; Standards-Based Service-Oriented Architecture; Information System Components; Robust, Mature Infrastructure and Archiving and Certification and Governance. The NANOOS web and products team, in coordination with the NANOOS User Products Committee (UPC), DMAC, and Education & Outreach (E&O) committees, will continue to enhance the web interface, user products, and visualization and data discovery tools, as funding permits.

4) Modeling and Analysis Subsystem: With limited funds, NANOOS will focus on sustaining existing numerical modeling systems in WA and OR, as operated by UW (Jones, MacCready, Banas), OHSU (Baptista), and OSU (Kurapov). Currently, these circulation models cover coastal OR (OSU), Columbia R and other OR estuaries (OHSU) and Puget Sound (UW). These models feed a variety of tools and user products. Our long-range intention is to build on previous investments, both IOOS and non-IOOS, with the goal of integrating the various NANOOS sub-regional modeling efforts into a unified ocean analysis and prediction system that incorporates NOAA/IOOS standards for model validation and data availability. The NANOOS ocean analysis and prediction effort will not be focused on improving the numerical modeling for its own sake, but will emphasize useful, validated products and tools that support a full range of critical decision making and problem solving domains, including crisis response and marine spatial planning.

5) Education and Outreach (E&O) Subsystem: NANOOS E&O efforts will be focused on education and user engagement in three main areas: 1. Networking: to increase awareness about NANOOS and products; 2. Product Development: to engage users in NANOOS ocean observing efforts through

NANOOS designed communication tools and products; 3. User Engagement: to support users in accessing and interpreting NANOOS data in a manner appropriate to their needs.

We will build on current accomplishments with a focus on strengthening two-way communication between NANOOS (PIs, Tri-committees, and GC) and end-user groups. This is a necessary next step as NANOOS matures in efforts to effectively meet user needs through product development and engagement. NANOOS E&O staff are located in Seattle, WA (Sprenger, UW) and Portland, OR (Mikulak, UW)

Our developed partnerships with key programs in the PNW and nationally – including OR Sea Grant, Padilla Bay NERR, COSEE Ocean Learning Communities, COSEE Pacific Partnerships, COSEE Networked Ocean World, the NFRA EOC, and NANOOS members such as NAME, CMOP, and Ocean Inquiry Project – provide learning opportunities surrounding ocean observing data for classrooms and non-classroom audiences. We will utilize this partner network to participate in professional development workshops for educators and present and receive feedback on NANOOS educational materials.

WORK COMPLETED

U.S. IOOS regional awards were finalized by NOAA in late August 2011, so work on this award is just beginning.

RESULTS

As stated, because U.S. IOOS regional awards were finalized by NOAA in late August 2011, and work from this project award is just beginning, specific and meaningful results and their significance, arising from this award will be reported next year.

Significant results from the first four years of NANOOS funding via NOAA IOOS were: identification of regional stakeholder needs, consolidation and leveraging of observing system efforts, a regional portal serving real-time and time series data accessible to the public, specifically tailored user products used by industries, agencies, tribes, and scientists for specific purposes, and through active outreach and education, the creation of a larger ocean-literate populous that can derive understanding and benefit from the data, data products, and decision support tools NANOOS has produced.

IMPACT AND APPLICATIONS

National Security

Robust, competent and reliable regional coastal ocean and estuarine observing systems such as the one managed by NANOOS in the Pacific Northwest have significant potential to provide needed information, tools, knowledge and techniques important in National Security and/or Homeland Defense. Particularly in the area of Marine Domain Awareness (MDA), the entire suite of products and services provided by NANOOS will allow for a much more complete Common Operational Picture (COP) needed by both national security and homeland security professionals as they work on intelligence preparation of areas of interest in the Pacific Northwest. NANOOS principals have participated in classified and unclassified homeland defense and national security exercises that stressed the importance of the types of information and products NANOOS produces.

Economic Development

NANOOS relies on direct involvement of private industry to ensure we optimize the economic development potential of our efforts. In some areas the economic development potential of better products delivered by NANOOS is evident (e.g., better environmental information permits more timely and accurate economic decisions by shellfish growers or tuna fishers) while others are more subtle but equally important (e.g., entraining large private industries such as Boeing into the IOOS framework or having Microsoft Inc. host the Pacific Northwest IOOS Workshop). While the final outcomes of such ventures is yet to be known, it is clear that by building an informed constituency that is fluent with the economic potential of NANOOS/IOOS deliverables, we will enhance our utility in generating and sustaining economic benefits.

Quality of Life

The coastal oceans and estuaries of the Pacific Northwest are critical to our society and quality of life. As occurs elsewhere in the country, rapid growth and concentration of our population near our coasts and estuaries places increasing and conflicting demands on these ecosystems that impacts quality of life. NANOOS fully participates in developing the data, information, tools, knowledge and techniques needed to be able to make scientifically-sound decisions about regional coastal and estuary ecosystems in the time frame necessary for these decisions to be useful and beneficial.

Science Education and Communication

NANOOS anticipates continued constructive impacts of its science education and communication efforts through continuing formal involvement in traditional educational fora (e.g., Washington and Oregon COSEE efforts, partnering with the educational efforts in the NSF-funded Science and Technology Center for Coastal Margin Observation and Prediction, and direct affiliation with major research universities in the Pacific Northwest). These efforts are bolstered in NANOOS by focused and proactive outreach efforts to local/regional aquaria, private ocean science education efforts such as The Ocean Inquiry Project, and training courses/syllabi provided on the NANOOS website for elementary and secondary school use.

TRANSITIONS

National Security

The potential impacts noted above that NANOOS could have on National and Homeland Security will take time to realize. We note here that U.S. IOOS regional awards were finalized by NOAA in late August 2011, so work on this award is just beginning and we report no transitions from these NOPP project funds at this point.

Economic Development

The potential economic developments impacts noted above that NANOOS could enable will take time to realize. We note here that U.S. IOOS regional awards were finalized by NOAA in late August 2011, so work on this award is just beginning and we report no transitions from these NOPP project funds at this point.

Quality of Life

The potential impacts noted above that NANOOS could have on the quality of life in the Pacific Northwest will take time to realize. We note here that U.S. IOOS regional awards were finalized by

NOAA in late August 2011, so work on this award is just beginning and we report no transitions from these NOPP project funds at this point.

Science Education and Communication

The potential impacts noted above that NANOOS will continue to have on science education and communication will take time come to fruition. We note here that U.S. IOOS regional awards were finalized by NOAA in late August 2011, so work on this award is just beginning and we report no transitions from these NOPP project funds at this point.

RELATED PROJECTS

NANOOS, part of US IOOS (<http://www.ioos.gov/>), is one of eleven Regional Associations that deliver the coastal regional system for the nation. NANOOS works with all eleven as part of the National Federation of Regional Associations (<http://www.usnfra.org/>). Recently, NANOOS joined with its two sister Regional Associations on the contiguous U.S. west coast to sign a Memorandum of Agreement, which is featured on our NANOOS website (<http://www.nanoos.org/>), along with those of the Central and Northern California Ocean Observing System (CeNCOOS; <http://www.cencoos.org/>) and Southern California Coastal Ocean Observing System (SCCOOS; <http://www.sccoos.org/>).

OUTREACH MATERIALS

While not constructed with funds from this project, the NANOOS brochure is available at: http://www.nanoos.org/documents/legacy/nanoos_brochure.pdf.

Other outreach items, such as newsletters and key NANOOS documents, can be downloaded at http://www.nanoos.org/about_nanoos/documents.php.