Progress Report for
Enhancing Northwest Association of Networked Ocean Observing Systems (NANOOS):
The Pacific Northwest IOOS Regional Association
#NA08NOS4730290
1 June 2010 – 30 November, 2010

This progress report describes activities carried out in support of enhancing the Northwest Association of Networked Ocean Observing Systems (NANOOS). This report was compiled by Jan Newton, NANOOS Executive Director and David Martin, NANOOS Board Chair; the co-PIs for this grant. Newton and Martin, in consultation with the NANOOS Governing Council and its Executive Committee, execute the activities of this award. Per NOAA anticipatory guidance concerning the eventual combining of RA Planning and RCOOS awards, NANOOS begins to implement this NOAA-desired end-state by submitting progress reports for this grant while noting outcomes from the NANOOS RCOOS grant that were enabled and accelerated by collaborative resource allocations from these complimentary Planning Grant efforts.

1) Project Summary

The goal of this project remains the same: to foster and enhance Pacific Northwest (PNW) regional partnerships in order to grow constituencies and to implement a governance structure and business plan that permit official federal certification of NANOOS as the PNW Integrated Ocean Observing System (IOOS) Regional Association and allow for the installation and long-term maintenance of a PNW Regional Coastal Ocean Observing System (RCOOS).

Stated NANOOS objectives of the project are to:

1) **Continue to identify and engage the full and expanding spectrum of stakeholders** having significant interests in the waters of the Pacific Northwest to ensure their views and opinions are fully recognized and taken into account in all aspects of planning, science and governance, and that this partnership building effort takes advantage of their scientific, economic, social, cultural and operational expertise.
2) **Proactively engage the regional ocean science community** in this partnership-building project to ensure their expertise helps guide the eventual design and evaluation of the system. This approach will ensure that PNW Regional IOOS evolves to take advantage of new knowledge and technology as they are developed.
3) **Obtain input about sub-regional scale oceanographic concerns** by engaging with local stakeholders to ensure these factors are addressed at the Regional level. NANOOS will work within these smaller groups to build a sense of community and partnerships at the sub-regional scale and then translate this into strong regional partnerships through larger gatherings and workshops.
4) **Implement the results of the consensus agreement on the overall Governance structure for NANOOS**.
5) **Develop and implement a Business Plan** to guide NANOOS budget formulation, involvement of users, all aspects of linkages between observations and products, research and development decisions, training, and alternate funding opportunities.
6) **Strengthen international and inter-Regional partnerships** by engaging with Canadian colleagues and other western Regional Association efforts to build bridges to these efforts and ensure seamless integration of these efforts.

7) **Continue to engage at the national level** to ensure the PNW activities of NANOOS are fully supportive of the national effort to implement and maintain an IOOS.

2) Progress and accomplishments

To achieve the above seven NANOOS Objectives, NANOOS Leadership interacts with the NANOOS Governing Council, its Executive Committee (elected sector representatives and committee chairs), and three Standing Committees (Data Management and Communication = DMAC; User Products = UPC; Education and Outreach = EOC). Key highlights of NANOOS progress and accomplishments for this period that cumulatively address the objectives are listed below, with reports from each of the three standing committees and the requested additional programmatic updates following. This report encompasses efforts funded by this RA grant as well as our RCOOS grant, since all of these NANOOS activities are necessarily highly integrated.

Major activities:

- **NANOOS revises MOA; constitutes an expanded Executive Committee** – In early August 2010, NANOOS posted its revised MOA on the web. The new version reflects revisions presented to the Governing Council during their May 2010 meeting and their requested modifications. Revisions to the MOA largely corrected language that was no longer accurate as NANOOS has evolved and also reflected clarifications requested by some member organizations. The major substantive change was revision of the governance structure, through creation of an elected 17-member Board with sector representation from academia, federal, state, and tribal governments, industry, and non-profit organizations to replace the former four offices of President, Vice President, Secretary and Treasurer. The former offices of President and Vice President are now the Chair and Vice Chair of the Governing Council Board, with the same responsibilities as before. This Governing Council Board plus the three Standing Committee Chairs and the Executive Director now compose the Governing Council Executive Committee (ExCom). The newly elected Board (David Martin, Chair; Antonio Baptista, Vice Chair) was activated in August.

- **NANOOS submits 5-y proposal for RA/RCOOS support and development** – NANOOS used an open Letter of Intent (LOI) process and its Governing Council Executive Committee (Ex Com) acting on behalf of the Governing Council to make decisions on its 5-y proposal response to the FFO for IOOS and to prioritize individual contributions to the proposal. NANOOS initiated its response process to the un-released FFO at the May Governing Council meeting by gaining input on NANOOS priorities and strategy. The July All-PI meeting provided review of all current activities and input from PIs on concerns and ideas for future work. The three NANOOS standing committees (DMAC, User Products, and Education/Outreach) also gave input at their respective meetings. NANOOS employed an openly advertised LOI process to assure that NANOOS had input from anyone who wanted to contribute. During two conference calls on 19 and 31 August, the ExCom provided the difficult tasks of establishing NANOOS' prioritization for spending scenarios, and ranking and selecting the top LOIs. NANOOS' proposal submitted 1 October requests $4M for operation of its RA/RCOOS. Funds for the full award will be distributed among nine regional partners and will cover observations, DMAC, user products and modeling, and education and outreach activities. Letters of support included: NOAA OAR West Coast Ocean Acidification Monitoring Program; the West Coast Governors'

Agreement on Ocean Health; and a collective of OR and WA State offices, Regional NOAA, and The Nature Conservancy collaboratively working on PNW Coastal Marine Spatial Planning.

- **NANOOS submits proposal on acoustics and whales** – NANOOS also responded to Topic Area 4 of the NOPP FFO regarding acoustics and migratory marine species. NANOOS submitted a proposal entitled "Incorporating acoustic and migratory biological data into NANOOS". It represents a university-industry partnership, including the Pacific Northwest National Laboratory, Cascadia Research, BioSonics, Inc., and the Pacific Ocean Shelf Tracking Project.

- **NANOOS attends NFRA Board and IOOS meetings** – Newton and Martin attended these semi-annual meetings on 15-18 November in Washington, DC. In addition to representing NANOOS, Newton helped plan and lead IOOS meeting sessions on ocean acidification (co-led with Alex Isern, NSF) and IOOS/RA website improvements (co-led with Marina Kraus, NOAA IOOS). During this time Martin attended classified meetings on impacts of Arctic climate change in coordination with the Director of the national IOOS Office.

- **NANOOS All PI Meeting** – NANOOS had overwhelmingly high attendance from the PIs implementing the NANOOS RCOOS work at the "All PI Meeting" held 1 July in Portland, OR at the OSU Center. While fieldwork precluded a few from attending in person, all twenty PIs submitted brief presentations that were given and discussed at the meeting. The three standing committee Chairs for NANOOS (DMAC, UPC, E&O) also gave reports. Discussed were future vision (stay the course, which is effective), problems (lack of support for ship time; aging of infrastructure with no funds to replace), and ways to improve communication.

- **NANOOS launches new observing assets amid recognition and thanks** – The new offshore buoy and glider funded by the Murdock Charitable Trust and the University of Washington for observations off La Push WA were deployed in July and recognized at two major events. The assets were recovered on 16 October, with data available from NANOOS.
  - On 12 July, a "Launch" event was held in Seattle at APL-UW to view the coastal buoy and glider, recognize the contributions of key partners, and provide information to the press. Speaking at the event were Congressman Norm Dicks, NOAA IOOS Deputy Director Suzanne Skelley, UW College of the Environment Dean Lisa Graumlich, NOAA Scientists Dick Feely and Chris Sabine, Project PI and NANOOS Executive Director Jan Newton, and Quileute Tribal Council Chairwoman Anna Rose Counsell-Geyer who dedicated the buoy's name Cha'ba, meaning "whale tail."
  - On 16 July, the Olympic Coast National Marine Sanctuary's Advisory Council invited Jan Newton and Timi Vann (NOAA Western Region) to speak at their meeting in La Push. The buoy and glider were successfully deployed that day and real-time data was available at the conclusion of the meeting.
  - The buoy project represents collaboration between: the Murdock Charitable Trust; University of Washington; NOAA IOOS & NANOOS; NOAA Olympic Coast National Marine Sanctuary; NOAA Pacific Marine Environmental Laboratory (PMEL); NOAA Western Region; the Olympic Coast Intergovernmental Policy Council composed of the Quileute, Hoh, Makah Tribes, the Quinault Indian Nation, and the State of Washington; and many other partners.

Other activities:

- **NANOOS/IOOS input to ACT** – The Alliance for Coastal Technologies (ACT) invited Newton to co-Chair their newly reconstituted Advisory Council, replacing the former Stakeholder Committee. She, along with Josie Quintrell (NFRA), will work to assure coordination between the IOOS RAs and ACT. Newton attended the ACT Board meeting on 3-4 June in Ann Arbor MI along with Gabrielle Canonico (NOAA IOOS) where several ideas and opportunities for coordination were discussed.

- **NANOOS and CMSP** – NANOOS accelerated the development of a strategy and partnerships in support of Coastal and Marine Spatial Planning (CMSP) needs in the Pacific NW and the West Coast. We have engaged with regional CMSP efforts by supporting needs assessments, participating in regional coordination projects, and facilitating discussions to identify objectives and tasks that take advantage of NANOOS' specific strengths to complement those of other CMSP partners. This engagement, led by Emilio Mayorga (NANOOS; APL-UW) was refined during two CMSP-focused, strategic discussions among NANOOS partners (12 August and 19 November) and in multiple additional interactions, including: support of the Washington state CMSP planning process (workshops in July and Sept; NANOOS co-sponsored 5 sessions in September including one at Oceans 2010), support of the Oregon state research-footprint data assessment (October), and continued participation in the West Coast Coastal Atlas (WCCA) community (30 November webinar). NANOOS' engagement and commitment to support the needs of regional decision makers and the wider CMSP community was reflected throughout the RCOOS renewal proposal submitted to the NOPP in September. More recently (November), NANOOS and its member partners served as lead participants in the West Coast Governors' Agreement on Ocean Health (WCGAOH) response to NOAA's Regional Ocean Partnership funding program. Starting from our ongoing WCCA engagement, we led the integration of efforts and goals among the three West Coast RA's and the WCCA community in support of the WCGAOH proposal. We will present our work and regional perspective on IOOS-CMSP collaborations at the upcoming ASLO conference in February.

- **NANOOS and Ocean Acidification** – NANOOS, in collaboration with NOAA PMEL, announces inclusion of pCO_2 as a variable available in near-real time through the NANOOS Visualization System (NVS). During summer, pCO_2 from NOAA sensors was reported and will be live again following winter maintenance. Also during this period, NANOOS has engaged in furthering attention to this important priority issue in several ways: 1. Newton was invited to and attended the Ocean Acidification Effects on West Coast Shellfish Workshop on 7-8 July in Costa Mesa, CA. The workshop was in response to concerns raised by west coast shellfish industry interests and was hosted by the west coast Sea Grant programs, the California Ocean Science Trust and NOAA's Integrated Ocean Observing System. Newton was a moderator of a session on how to modify monitoring/research program designs to enhance cross-discipline analyses. She has joined the Steering Committee of the resulting C-CAN (California Current Acidification Network). 2. Newton also attended the ACT sponsored workshop on pCO_2 sensors at NOAA PMEL on 13-14 July in Seattle. 3. Additionally, Newton was one of three speakers at a public evening event on Ocean Acidification at the Northwest Maritime Center in Port Townsend, WA on 7 October. Newton presented "Current research and monitoring in Washington waters" highlighting NANOOS and the NVS system and outlining a vision for PNW OA observing.

➢ **NANOOS actively engages PNW Tribes** – NANOOS and its member partner the NSF-funded CMOP work actively to facilitate increased participation of Native American tribes in ocean observing efforts and use of information. Several efforts occurred during this period: 1. Following Newton's participation in the NOAA-sponsored 2010 Career Fair and Training Symposium at the Northwest Indian College (NWIC) in Bellingham, WA, several students were attracted to a CMOP-sponsored Native Environmental Science Internship experience out of the UW Friday Harbor Laboratories during fall, 2010. Several NWIC students and faculty attended a cruise Newton led observing water, plankton, marine mammals and seabirds on 29 October. Plans are gelling to extend this experience year-round leveraging several programs. 2. Newton was invited to brief the Northwest Indian Fisheries Commission on 12 August in Olympia, WA on NANOOS' ocean acidification observations. Numerous tribal representatives were impressed with the utility of NVS. 3. Newton was invited to meet with Chad Bowechop representing the Makah Tribal Council on 15 July in Neah Bay to brief him on NANOOS and the opportunities it presents. A recent death of a tribal elder precluded the presentation to the full council.

➢ **NANOOS works to highlight relevance of IOOS in HAB document** – Newton served on a committee formed by Marc Suddleson, NOAA NOS, along with Raphe Kudela (UC Santa Cruz) and Dan Ayres (WA Dept Fish & Wildlife), to draft "A West Coast Harmful Algal Bloom Monitoring, Alert and Response Network" briefing document as a follow-up response to a West Coast Governors' Agreement on Ocean Health meeting on HABs. Newton worked with the committee to assure reference in the document on leveraging IOOS as part a fundamental part of the network. The document states its Requirements for Successful Activation of the West Coast HAB Network: "We must harness, integrate, and build the current capacity. Successful activation of the network depends on:

- States continuing to fund HAB monitoring and shellfish surveillance activities.
- NOAA supporting the enhancement of existing West Coast IOOS systems and continued funding for West Coast partnership projects that advance HAB prediction, monitoring, and response priorities.
- IOOS Regional Associations continuing and enhancing work to include HAB monitoring and research needs in planning and expansion of ocean observing systems.
- The HAB Research Community working closely with state, federal, IOOS systems, and industry managers to optimize the usefulness of the data collected by all.
- The U.S. Congress providing the financial support and legislative guidance to continue effective HAB monitoring networks into the future."

➢ **NANOOS participates in CWO 2010** – NANOOS was represented by Newton at the California and the World Ocean 2010 Conference held 7-10 September in San Francisco, CA. Newton provided input and slides to Steve Ramp (CeNCOOS) for his talk "West Coast Regional Ocean Observing: What We're Doing For You" in the session on using science to inform policy. Additionally, Newton was invited to present "NANOOS contributions to understanding ocean acidification in the Pacific Northwest" in a session on ocean acidification.

➢ **NANOOS, IOOS, and Oceans 2010** – Martin Co-chaired the Technical Committee for the MTS/IEEE Oceans 2010 Conference held 20-23 September in Seattle, WA. The conference included two IOOS sessions chaired separately by Martin and Newton. In one of these, Newton presented "NANOOS Contributions to Understanding Ocean Acidification in the Pacific

Northwest" with co-authors from UW, NOAA PMEL and OSU. Additionally, Martin was the Chair for an IOOS Town Hall session on RA Certification held at this conference at the request of the national IOOS Office.

➢ **NANOOS briefs Ocean Studies Board** – Newton joined a briefing from IOOS and various RA Directors/representatives to the National Academies Ocean Studies Board on 10 November in Seattle. She joined Harvey Seim (SECOORA), Joe Schumacker (Quinault Indian Nation, a NANOOS member), Steve Ramp (CeNCOOS), Steve Ackelson (ONR, Interagency Ocean Observation Committee) and Zdenka Willis (NOAA IOOS Program Director) in briefing the Board on what IOOS is and does. Newton's presentation was on the role of a Regional Association, using NANOOS as an example.

➢ **Energy Use in Fisheries Symposium** – NANOOS participated in the first Energy Use in Fisheries Symposium (http://www.energyfish.nmfs.noaa.gov) in Seattle, to help disseminate the use of IOOS products in the fisheries community. Representing NANOOS, Emilio Mayorga was invited to be a panelist at the 17 November session on Operating Strategies & Vessel Maintenance, delivering a presentation on IOOS data integration and relevant NANOOS user products prepared jointly with David Jones (APL-UW).

➢ **Other NANOOS/IOOS briefings/meetings/coordination:**

- Newton was invited to give the keynote address to the Murdock Charitable Trust "Partners in Science" program on 13 August in Vancouver, WA. This is a program linking High School teachers with research scientists for 2 years. Newton discussed local ocean observations regarding hypoxia and ocean acidification, showing the audience data access from NANOOS NVS as well as several the web-based education tools. Numerous participants enthusiastically followed up.
- Newton and NANOOS E&O coordinator Amy Sprenger participated with the Olympic Coast National Marine Sanctuary staff, Carol Bernthal, Superintendent, and Jacqueline Laverdure, OCNMS Acting Education Coordinator, in a conference call 20 August regarding how to share strategies for education, filling some OCNMS needs with optimized NANOOS products.
- Newton obtained NANOOS standing committee input to future proposed NANOOS strategies during meetings of the DMAC committee on 26 August and the E&O committee on 1 Sept.
- In October, Martin participated in discussions with environmental staff for the Commander, Naval Region Northwest, Commander Submarine Group Nine, SSBN Security from the Chief of Naval Operations staff, and staff from the Oceanographer of the Navy's office on the implications of operational and research ocean observing systems in the Pacific Northwest.

NANOOS Standing Committee updates:

➢ **NANOOS DMAC** – Chaired by Steve Uczekaj (The Boeing Company) this committee, composed of members from Boeing, OHSU, UW, OSU, and DOGAMI, has weekly "tag-up" calls to achieve consistent work efforts for NANOOS DMAC. In addition, Uczekaj and/or Rick Blair of Boeing, participates in regular IOOS Regional DIF Implementation (RDI) team bi-weekly conference calls and DMAC steering committee weekly call-ins.

The DMAC group, working with individuals from UPC and E&O, continues to play a key role in support of the NANOOS Visualization System (NVS). During this 6-month period significant progress was made in adding additional assets and data offerings to NVS and DMAC as a whole. Among these are:

1. Four Washington Department of Ecology moorings
2. APL-UW La Push Glider
3. RCA Dabob Bay Buoy
4. Two OSU Newport-Line (NH-10) Slocum Gliders
5. CMOP Columbia Estuary Model extracts at 19 stations
6. ORCA Twanoh and Hoodsport buoy data for Near-Bottom Depth
7. APL-UW Cha'ba Buoy
8. HF Radar Overlays
9. WAVEWATCH III overlays for all forecast time steps
10. CMOP South West Washington Slocum glider
11. CMOP Staturn03 and Saturn02 moorings
12. Environment Canada Far offshore buoy.

The NANOOS DMAC is also involved with the development of the NANOOS Visualization System (NVS) extensible framework. This base NVS architecture provides a flexible and extensible framework for providing IOOS standard data services as well as metadata driven visualization of data. This architecture was presented at the Oceans '10 conference in Seattle, Washington by Emilio Mayorga (NANOOS DMAC, APL-UW).

Work has also continued on alternate data encodings for DMAC data services. Specifically Java Script Object Notation (JSON) is used to pass data between the NVS framework and the mobile phone applications. Several JSON data encoding patterns are being investigated by various regions including NANOOS for inclusion in future IOOS standard recommendations.

During this period an Android NVS mobile phone application was released to the Android Marketplace. This application allows for the browsing all NANOOS observing assets on your Android based mobile phone. An update to the NVS iPhone application was also released to the Apple App store. Both mobile applications now allow for the browsing of near real-time observation data as well as 24 hour, 7day and 30 day plots.

Currently, NANOOS is still one of 2 regions to participate in the creation of the IOOS Registry, Catalogue, Viewer (RCV) application. NANOOS data sources are being used during RCV development to test the data ingestion and DIF standards verification.

NANOOS has engaged its IOOS national and regional partners by sharing our experience gained in the development of the NANOOS Visualization System (NVS). On 29 September NANOOS DMAC members led an IOOS RDI conference call discussion on technical aspects of the NVS presentation of asset information. We collaborated directly with SECOORA and PacIOOS in answering questions and sharing NVS resources in support of the development of their user products. We also worked closely with the Padilla Bay NERR to overhaul Washington data access for the Real-time Water Quality Data application for Shellfish Growers and provide access to NVS' user-friendly data services.

NANOOS DMAC was represented at IEEE OCEANS 2010 Conference with the presentation of the following paper:

Mayorga, E., T. Tanner, R. Blair, A.V. Jaramillo, N. Lederer, C.M. Risien, and C. Seaton. The NANOOS Visualization System (NVS): Lessons Learned in Data Aggregation, Management and Reuse, for a User Application. OCEANS 2010, MTS/IEEE Seattle - Innerspace: A Global Responsibility, September 2010.

- **NANOOS User Products Committee (UPC)** – Chaired by Jonathan Allan (Oregon Department of Geology and Mineral Industries) this committee is composed of members from Boeing, OHSU, UW, OSU, NANOOS E&O, OR Sea Grant, and NOAA. NANOOS UPC chair Allan participates in weekly "tag-up" calls of a smaller sub-group comprised of members of UPC, DMAC, and Web development in order to achieve consistent work efforts and improvements to products that are being developed through the synergy between these three groups.

The NANOOS UPC/DMAC sub-working group continues to play a key role both in terms of providing ongoing support for the NANOOS Visualization System (NVS) and through continued enhancements to its overall usability and functionality. This UPC/DMAC synergy has been a key element in the overall success of the NVS platform and has resulted in continued progress and expansion of to include new datasets that previously were inaccessible to the public-at-large as well as enhancements to data viewing and querying in NVS. During this period, a core group of members from DMAC, UPC and E&O met at Oregon State University in early November to plan activities and proposed enhancements to NANOOS user products and DMAC, including NVS, web, NERDDAP and phone apps.

Over the past six months, NANOOS DMAC and UPC have continued to focus significant effort at improving NVS as well as the development of several new products. NVS 2.0 was released in August 2010. This release marked a significant step forward for NVS as it includes a completely overhauled user interface that, for example, allows users to quickly select regions of interest and optimizes the available map-based interface as well as the development of several new products. Another enhancement to NVS is the addition of a 'Comparator' tool, which allows the user to visualize comparisons between measurements such as the significant wave height and in this case the modeled Wavewatch III wave height for a particular asset location. The comparator shows the daily changes to the modeled results, which provides an indication of the relative improvements in the modeled results over time. The Comparator tool presently allows user to make comparisons between modeled results for a suite of wave and climate related parameters. These and other NVS enhancements are described in detail in Mayorga et al. (2010), cited above.

Aside from ongoing improvements to NVS, NANOOS released a 'Forecast Information and Data Products for Tuna Fishers' web page[1] that synthesizes multiple datasets including satellite-based products (Chlorophyll and SST), HF radar, and modeled forecasts of wave statistics and ocean conditions from 24 hours out through several days, making these datasets more accessible to commercial tuna fisherman. NANOOS also released the 'NVS - Beach and Shoreline Mapping' portal[2], which presently integrates beach measurements that are being collected by the Oregon Department of Geology and Mineral Industries on the Oregon coast. Having now

[1] http://www.nanoos.org/data/products/tuna_fishers/tuna_fishers.php
[2] http://www.nanoos.org/nvs/nvs.php?section=NVS-Products-Beaches-Mapping

developed a workable model for integrating such datasets, planned future improvements will include the inclusion of datum-based shorelines collected in Oregon, beach change information that are being collected by the Washington Department of Ecology for the Southwest Washington coast, and nearshore bathymetry data being collected by Oregon State University.

Work continues on an experimental NERDDAP data aggregation service that blends the ERDDAP framework with NANOOS packaging and identified priorities. A prototype of the NERDDAP tool is currently operational. However, additional improvements are required before making this tool publicly available. We anticipate having a public release of this product during the next six months. Work is also progressing on an updated version of the NVS iPhone and iPod Touch app that will eventually integrate overlays such as HF Radar and satellite-based datasets.

- **NANOOS Education and Outreach Committee (EOC)** – Work during this period has primarily been completed by Sprenger and Mikulak, with guidance and help from EOC members. Due to the new NANOOS Executive Committee structure enacted in June, on 1 August Mike Kosro stepped down as NANOOS EOC chair and the committee voted Nancee Hunter, the Director of Education for Oregon Sea Grant, as the new committee chair. The EOC is composed of members from CMOP, OR and WA Sea Grants, OSU, Hood Canal Salmon Enhancement Group, Ocean Inquiry Project, Padilla Bay National Estuarine Research Reserve, South Slough National Estuarine Research Reserve, Olympic Coast National Marine Sanctuary, and COSEE Pacific Partnerships. The EOC in previous reporting periods had been meeting ad hoc, but since June 2010 have been moving towards monthly conference calls.

Ocean Literacy: Ocean literacy efforts have continued on two fronts – educator workshops and marine science center exhibit development. Sprenger has been actively involved in partnering with several local and regional groups, including the Northwest Aquatic and Marine Educators, Oregon and Washington Sea Grants, COSEE Pacific Partnerships, COSEE Ocean Learning Communities, Service Education and Adventure, Edmonds Community College and Ocean Inquiry Project to plan and provide professional development opportunities for NW educators. Mikulak has continued partnerships and communication with regional educators to develop the modular exhibit looking at seasonal trends of physical and chemical water properties.

Outreach to users: In terms of outreach, NANOOS continues to exhibit and/or present on NANOOS at gatherings attended by individuals/groups of NANOOS stakeholders and users. Sprenger and Mikulak are working with NANOOS DMAC and UPC to create more "theme pages" for the NANOOS website. Upcoming theme pages in progress include coastal hazards and HABS. Outreach and networking efforts through Facebook and the NANOOS Observer newsletter also continued. NANOOS supported and staffed IOOS/RA booths at national and regional conferences for potential ocean observing information users held within this region. Finally, Sprenger and Mikulak assisted to create E&O related content for the RCOOS proposal recently submitted on Oct 1. Sprenger and Mikulak continue to work with the NFRA Education and Outreach Council, participating in the monthly conference calls.

E&O Presentations:

Sprenger, A. *Eyes on Washington Waters, Bringing Ocean Observing Data Into the Classroom*. Washington Watershed Education Teacher Training Program, Anacortes, WA June 12-13 2010.

Carlin-Morgan, K., N. Hunter, and A. Sprenger. *Using the Ocean to Teach STEM*. Northwest Aquatic and Marine Educators Conference. July 2010, Florence, OR.

Mikulak, S. & A. Sprenger. *Hypoxia in Oregon and Washington: Using Data to Understand the "Dead Zones".* Northwest Aquatic and Marine Educators Conference. July 2010, Florence, OR.

Simoniello, C., L. Spence, S. Mikulak, S. Stewart, and J. Dorton. *The U.S. Integrated Ocean Observing System: Eyes on the Ocean, Hands-On Learning.* National Marine Educators Association Conference. July 2010. Gatlinburg, TN.

Newton, J. and A. Sprenger. *Eyes on Pacific Northwest Waters, Bringing Ocean Observing Data Into the Community College Classroom*. COSEE Pacific Partnerships Community College Educator Workshop, August 2010. Western Washington University, Anacortes, WA.

A. Sprenger. *Eyes on Pacific Northwest Waters, Bringing Ocean Observing Data Into the Classroom.* University of Washington OACIS GK-12 Teacher/Fellow Workshop. August 2010. Friday Harbor Labs, Friday harbor, WA

Hannafious, D. & A. Sprenger, *Bringing the Layers of Marine Water to the Classroom w/ Hood Canal Salmon Enhancement Group*. Storming the Sound South. October 2010. Tacoma WA.

Sprenger, A. *Bringing the Layers of Marine Water to the Classroom.* Storming the Sound West. October 2010. Port Angeles WA.

Sprenger, A. *Eyes on Washington Waters, Bringing Ocean Observing Data Into the Classroom*. Washington Watershed Education Teacher Training Program. November 6-7, 2010. Tacoma, WA.

Sprenger, A. *Eyes on Washington Waters, Bringing Ocean Observing Data Into the Classroom*. Washington Watershed Education Teacher Training Program. November 13, 2010. Union, WA.

Outreach Events:

California and the World Ocean (CWO), San Francisco, CA, Sept 7-10, 2010
- Shared booth with IOOS, CeNCOOS, and SCCOOS

MTS/IEEE Oceans 2010, Seattle WA, Sept 20-23, 2010
- IOOS booth with NANOOS, GLOS, CeNCOOS, with materials and laptops to demo RA sites

Heceta Head Conference: Florence, OR, Oct 29, 2010
- NANOOS booth with newsletters, stickers, pens and a laptop showing NVS at booth. Many attendees were OR coast residents, city employees, resource managers, or local politicians. Most conversations were educating people about what NANOOS is and the data we collect.

Pacific Marine Expo, Seattle WA, November 2010
- Had NANOOS materials and staff at the Alaska/Washington Sea Grant booth

- **Ongoing IOOS-related activity:**
  - ***NANOOS participation in NFRA and IOOS***
    - Newton and Martin participate in the monthly NFRA Board phone conferences.
    - Newton participates in NFRA Executive Committee teleconference calls and meetings.
    - Sprenger participates in the NFRA-IOOS led Education and Outreach teleconferences.
  - ***NANOOS participation in ACT***
    - Newton was appointed the Co-Chair of newly constituted Advisory Council, replacing the former Stakeholder Council of the Alliance for Coastal Technologies (ACT). As such, she routinely participates in the regularly scheduled Board meetings and teleconference

calls. She attended the ACT Board meeting in Ann Arbor MI on 3-4 June, representing IOOS RA-ACT coordination. She helped to lead the first conference call 1 Nov

- ***NANOOS integrations with CMOP***

  o Throughout the reporting period, Martin and Newton remained deeply involved with coordinate NANOOS activities with a complimentary research ocean observing effort in the Pacific Northwest, the NSF-funded Science and Technology Center (STC) for Coastal Margin Observation and Prediction (CMOP). NANOOS leverages CMOP in the areas of coastal observations, DMAC and Education and Outreach. This effort is strongly supported by the Director of the national IOOS office.

- ***NANOOS programmatic status updates***
  - RA organizational structure:
    - *Changes*: One new member organization was added to NANOOS this period: The Nature Conservancy.
  - Planning and implementation:
    - *Progress made towards the development of the business plan:* The NANOOS Business Plan was adopted at the NANOOS Governing Council meeting on 25 June 2009 and is posted on the NANOOS website.
    - *Progress toward defining regional observing system priorities:* The NANOOS Governing Council has re-confirmed the PNW regional observing system priorities in 2010; we continue to work with stakeholders to refine information needs regarding the priorities. The NANOOS RCOOS effort is directed toward addressing information needs about the top five regional priorities: Maritime Operations; Ecosystem Assessment; Fisheries and Biodiversity; Coastal Hazards; Climate Change. The NANOOS User Products Committee and Education and Outreach Committees are vital to this effort since there are many stakeholders on these committees. The process for this selection was described in our first RCOOS proposal (FY2007-9), which is posted on the NANOOS website and the Governing Council edited the original priorities slightly at its May 2010 meeting.
    - *Progress toward development of an observing system design for the region:* The design phase is completed and we are in the implementation phase. NANOOS has presented its observing system conceptual design to NOAA IOOS and its membership. It is posted on the NANOOS website and continues to be updated through implementation of the RCOOS effort, as funding allows.
    - *Progress toward regional data management:* NANOOS DMAC, funded from both the NANOOS RCOOS and this RA contract, continues to implement the regional data management system in accordance with the schedule presented in the RCOOS grant. Progress has been satisfactory during this period.

  o Stakeholder engagement:

NANOOS continues to actively engage with our stakeholders in numerous ways, via their participation on our Governing Council, Standing Committees, targeted theme pages on our web, and via the specific activities, reported throughout this document.

3) Scope of work – We had no changes to our statement of work. We neither anticipate changes to our statement of work, nor problems in meeting objectives of this effort.

4) Leadership personnel – No changes.

5) Budget analysis – Given institutional time lags in fiscal reporting, NANOOS continues to be adequately balanced in terms of budget expenditures and allotted time. Specifically, at the end of this reporting period, 06/01/10 through 11/30/10, NANOOS has expended 65% of its anticipated expenditures in support of this project while we have expended 85% of our allotted time. As previously stated we started the RA grant period conservatively, due to uncertainties in funding level of the RCOOS award and we have continued that trend subsequently, due to lags in funding availability due the inherently complex processes of both NOAA and UW fiscal systems. From experience, there are also lags in reporting of encumbrances as well. NANOOS plans to expend the remainder in an appropriate time period, increasing our web and outreach activities expenditures.