Northwest Association of Networked Ocean Observing Systems

Proposal submitted to the Integrated Ocean Observing System (IOOS) Program,
National Ocean Service (NOS), National Oceanic and Atmospheric Administration (NOAA),
Department of Commerce

Pursuant to the FY 2026 Implementation of the U.S. Integrated Ocean Observing System (IOOS)

Sustaining and Enhancing NANOOS, the Pacific Northwest Component of the U.S. IOOS

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Funding Request: $25,000,000

3. Abstract

NANOOS proposes to sustain its core capabilities and strategically enhance our system according to regional user needs. Our approach for the next five years sustains the expert personnel, infrastructure, and user-engagement behind established NANOOS datasets and data products. We aim to maintain valuable long-term records and vital support tools that are relied upon regionally for real-time decision making under highly variable environmental conditions. As funding allows, we will pursue select enhancements to our system guided by regional needs and national priorities.

4. Proposal Summary

Proposal Name/Title:
Sustaining and Enhancing NANOOS, the Pacific Northwest Component of the U.S. IOOS

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Proposal Summary:

Our goal is to sustain and enhance NANOOS to continue as the regional association for the Pacific Northwest (PNW) serving our regional user community in alignment with the vision and operations of the U.S. IOOS. By coordinating existing assets and placing strategic focus on new investments, NANOOS has produced a distributed observing system yielding informative and decision-relevant data products in five areas of concern (maritime operations, coastal hazards, fisheries and marine life, marine ecosystems, weather and climate) across three spatial domains (coastal ocean, estuaries, shorelines). For the next five-year funding cycle, our objectives and intended benefits are to:

1. Maintain NANOOS as the U.S. IOOS PNW Regional Association: Sustain our proven role for regional coordination, administrative infrastructure, and regional engagement, partnering with federal and non-federal (tribal, academic, state, local, industry, nonprofit, etc.) entities to serve their information needs.

2. Maintain and enhance surface current and wave observations: Maintain existing HF-Radar (HFR) and wave mapping or observing capabilities and extend these to currently unaddressed areas in the region (Strait of Juan de Fuca), providing national capacity for maritime safety along coasts and at critical ports and event response / floating object (e.g., search and rescue (SAR), harmful algal blooms (HABs), oil) tracking. Use these observations to support wave forecasting capability for safe navigation along our coast.

3. Sustain and enhance buoys and gliders in the PNW coastal ocean, in coordination with national and regional programs: Maintain, harden, and enhance existing buoys and gliders to provide broad regional physical, biogeochemical, and biological observations, with a focus on hypoxia, Harmful Algal Blooms (HABs), ocean acidification, and other regional priorities to help assess stressors affecting natural resources and ecosystems. Develop biological observations via acoustic tracking and passive acoustic monitoring networks to aid marine mammal ship strike avoidance.

4. Maintain and expand multidisciplinary observational capabilities in PNW estuaries and the nearshore, in coordination with local and regional programs: Sustain and enhance observing ability including on hypoxia, ocean acidification, and biological observations to inform sustainable resource management, understanding of how coastal upwelling affects estuarine conditions, supporting regional decision-making by agencies, tribes, non-profits, and communities. Biological observations will improve understanding of biodiversity and plankton community structure, supporting detection of ecosystem stressors, shifts in food-web structure, and strengthen links between physical and biogeochemical drivers and ecosystem responses.

5. Maintain and enhance core elements of beach and shoreline observing: Measure nearshore bathymetry, topographic beach profiles, shoreline morphodynamics, and real-time coastal hazard monitoring via webcams along OR and WA, contributing to hazard mitigation by providing essential observations and better decision support tools for coastal managers, planners, and engineers. Increased focus on real-time coastal erosion and flood monitoring will lead to better prepared coastal communities and better informed adaptation strategies.

6. Maintain, harden, and enhance the NANOOS Data Management and Cyberinfrastructure (DMAC) system for routine operational distribution of data and information: Sustain and enhance the DMAC system, including the NANOOS Visualization System (NVS), for dynamic and distributed data and product access.

7. Provide sustained support to a community of complementary regional numerical 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 Exclusive Economic Zone in both OR and WA, with strategic improvements to capabilities and scope, including forecasts for waves. Sustain wave forecasting at a major shipping conduit (Columbia River). Serve model output to support decisions including identifying safe navigation routes, optimizing shellfish growing practices, safeguarding natural resources, and planning.

8. Sustain and strengthen NANOOS engagement: Continue ongoing engagement with regional users and the public; engage more audiences in observations, increasing ocean awareness and literacy; grow the ocean and coastal workforce; improve our ability to provide relevant ocean and coastal data and information to coastal communities; and facilitate the use of NANOOS products for societal objectives, sustaining health, safety, and economy, the core task for which NANOOS exists.

9. Continue to deliver existing, and create new, innovative and transformative user-defined products and services for PNW users: Continue our NVS innovation in this vital translation for meaningful and informative data products that address user needs and serve society.

Partners:

Partnering is strong within NANOOS: a) through our PIs, b) through our regional prominence as a coordinating body, and c) through our governance.

a) The proposed efforts will be conducted in partnership with PIs at several NANOOS membership organizations who have maintained NANOOS to date: University of Washington (UW); Oregon State University (OSU); Columbia River Inter-Tribal Fish Commission (CRITFC); Oregon Department of Geology and Mineral Industries (DOGAMI); Oregon Department State Lands (ODSL); and Washington Department of Ecology (WA Ecology).

b) NANOOS coordinates specific PNW efforts with several federal and local entities, including NOAA Ocean Acidification Program, NOAA Pacific Marine Environmental Laboratory, NOAA Northwest Fisheries Science Center, NOAA California Current Integrated Ecosystem Assessment, Olympic Coast National Marine Sanctuary, National Estuarine Research Reserve Systems, West Coast Ocean Alliance, West Coast Ocean Data Portal, Canadian IOOS-Pacific, Washington Ocean Acidification Center, and numerous tribes, state, and local agencies. NANOOS coordinates with the National Science Foundation Ocean Observing Initiative, serving data from their PNW observing assets. NANOOS plays an important role in the PNW, as attested by letters from 28 entities covering a wide swath of PNW interests, including shellfish growers, bar pilots and maritime operators, tribes, emergency responders, fishing trade organizations, habitat restoration partnerships, industry, and educators who articulate how NANOOS makes a difference to their work and coastal ocean decisions.

c) The 78-member NANOOS Governing Council, the guiding body for this work, reflects a balanced composition of academic and research institutions (22%), tribal governments and tribal organizations (8%), federal, state and local governments (20%), industries (27%), and non-governmental organizations (23%). That partnership offers this proposal for submission.

5. Proposal Narrative and Milestone Schedule

a) Goals & Objectives

Our goal is to sustain and enhance NANOOS to continue as the regional association for the PNW serving our regional user community in alignment with the vision and operations of the U.S. IOOS. We aim to maintain U.S. IOOS program funding and to continue to engage a significant array of leveraged resources. By coordinating existing assets and placing strategic focus on new investments, NANOOS has produced a distributed observing system yielding informative and decision-relevant data products in five areas of concern (maritime operations, coastal hazards, fisheries and marine life, marine ecosystems, weather and climate) across three spatial domains (coastal ocean, estuaries, shorelines). From this system, NANOOS provides significant societal benefits to a wide spectrum of users including federal, tribal, state and local governments, industries, scientific researchers, non-governmental organizations (NGOs), educators, and the general public. NANOOS is PNW-managed and operated, federally certified, and maintains essential subsystems (Governance and Management, Observing, Data Management and Cyberinfrastructure, Modeling and Analysis, and Engagement) in coordination with U.S. IOOS.

For the next five-year funding cycle, our **objectives** annually are to:

1. Maintain NANOOS as the U.S. IOOS PNW Regional Association: Sustain our proven role for regional coordination, administrative infrastructure, and regional engagement, partnering with federal and non-federal (tribal, academic, state, local, industry, NGO, etc.) entities.

2. Maintain and enhance surface current and wave observations: Maintain existing and add new HF-Radar (HFR) and wave mapping or observing capabilities and extend these to currently unaddressed areas in the region, providing national capacity along coasts and at critical ports. Use observations to support wave forecasting capability.

3. Sustain and enhance buoys and gliders in the PNW coastal ocean, in coordination with national and regional programs: Maintain, harden, and enhance existing buoys and gliders to provide broad regional physical, biogeochemical, and biological observations, with focus on hypoxia, HABs, OA, and other regional priorities. Develop biological observations via acoustic tracking and passive acoustic monitoring networks, as part of West Coast wide efforts.

4. Maintain and expand multidisciplinary observational capabilities in PNW estuaries and the nearshore, in coordination with local and regional programs: Sustain and enhance observing ability including on hypoxia, OA, and biological observations to aid sustainable resource management.

5. Maintain and enhance core elements of beach and shoreline observing: Measure nearshore bathymetry, topographic beach profiles, shoreline morphodynamics, and real-time coastal hazard monitoring via webcams along OR and WA, contributing to hazard mitigation by providing essential observations and better decision support tools for coastal managers, planners, and engineers.

6. Maintain, harden, and enhance the NANOOS Data Management and Cyberinfrastructure (DMAC) system for routine operational distribution of data and information: Sustain and enhance the DMAC system, including the NANOOS Visualization System (NVS), for dynamic and distributed data access.

7. Provide sustained support to a community of complementary regional numerical 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 Exclusive Economic Zone in both OR and WA, with strategic improvements to capabilities and scope, including forecasts for waves.

8. Sustain and strengthen NANOOS engagement: Continue ongoing engagement with regional users and the public; engage more audiences in observations, increasing ocean awareness and literacy; grow the ocean and coastal workforce; improve our ability to provide relevant ocean and coastal data and information to coastal communities; and facilitate the use of NANOOS products for societal objectives, sustaining health, safety, and economy, the core task for which NANOOS exists.

9. Continue to deliver existing and create innovative and transformative user-defined products and services for PNW users: Continue our NVS innovation in this vital translation for meaningful and informative data products that address user needs and serve society.

b) Background

The Pacific Northwest (PNW) waters of the United States are critically linked to the societal, economic, and ecological health of the region. They modify and moderate regional weather, serve as highways for marine commerce across the Pacific Rim, are part of an oceanic buffer for national security, support a productive ecosystem, including significant natural and cultural resources, and provide exceptional recreational opportunities. The US Integrated Ocean Observing System (IOOS) was authorized by Congress to assure consistent availability of coastal ocean and Great Lakes data throughout the nation to diverse sectors of society. IOOS has funded the Northwest Association of Networked Ocean Observing Systems (NANOOS) to fill this role for over 20 years. The PNW states of Washington (WA) and Oregon (OR) now rely on coastal ocean data and products to support decisions that affect their health, safety, and livelihood, as evidenced by the strong Letters of Support from a wide reaching variety of organizations.

NANOOS was assembled by charter in 2003 and formally established by Memorandum of Agreement (MOA) in 2005 to serve the citizenry of the PNW. NANOOS has engaged representatives from a wide-ranging set of stakeholders and rightsholders who are directly involved in the definition and execution of NANOOS within the region and as part of the U.S. IOOS effort. Since 2004, NANOOS has received NOAA funds to build the PNW IOOS Regional Association (RA) and its Regional Coastal Ocean Observing System (RCOOS). NANOOS has been implemented with substantial regional involvement in every aspect: defining NANOOS, its governance structure, regional coordination, and prioritization. Our membership continues to contribute to and help define our NANOOS subsystems: observations; modeling; data management and cyberinfrastructure (including user products); and engagement. NANOOS achieved Certification in 2018 and passed recertification in 2023, with documented governance and data practices.

For its governance, NANOOS has an established Governing Council (GC) that is thriving, diverse, and continues to grow. Membership has grown from 25 in 2007 to nearly 80 today. Representation is from many sectors, including local, state, and federal agencies, tribes and tribal organizations, NGO/education organizations, industry, and academic institutions. NANOOS has a demonstrated, effective governance structure, with an elected Board of the GC from designated sectoral representation. The Executive Committee (EC), composed of the Board plus operational Chairs, advises NANOOS leadership. Principal Investigators (PIs) from multiple institutions have implemented NANOOS since 2007, authoring 208 NANOOS-supported publications.

NANOOS is an active participant in the U.S. IOOS and IOOS Association activities and is well-integrated with other regional observing systems [1]. Within the Pacific, NANOOS collaborates with CeNCOOS, SCCOOS, and AOOS, via several interactions, including ocean acidification indicators and work with shellfish growers and others through the West Coast Ocean Alliance, West Coast Ocean Data Portal, and other West Coast organizations, and with PacIOOS, AOOS, and other RAs via Backyard Buoys engaging community stewarded wave buoys. NANOOS collaborates nationally with the other RAs through IRA-funded work. NANOOS interacts substantially with Canada through their organizations and universities on our GC, and via coordination with Canadian IOOS (CIOOS)-Pacific and Ocean Networks Canada.

NANOOS' development was guided by years of meetings and regional input that NANOOS continues to collect. Key developmental factors have been maintaining a balanced focus on coastal ocean, estuarine, and shoreline observations and on product development to meet user needs. A host of data and user-defined products are currently available through NANOOS and the NANOOS Visualization System (NVS). Prioritization for activities and products continues to be advised by our regional engagement and active user involvement within NANOOS governance and committees.

To develop this proposal for the next five years we consulted the ***NANOOS GC who strongly recommended to sustain and enhance NANOOS.*** During the 2024 and 2025 GC meetings, overviews of the NANOOS enterprise were presented with a request for input on where improvements were needed or priorities have changed. The unanimous consensus each year was to retain all existing efforts, as benefits are being realized and support is strong for the continuation of these operations and services. Through GC discussions, NANOOS decided to engage only with its existing PIs for response to this NOFO, in order to address the effects of persistent flat-funding on critical systems and services and to strategically and efficiently enhance our observation and modeling capabilities and product delivery to PNW stakeholders. We also outline areas for growth based on user input; should funding be adequate, we will seek new PIs.

c) Audience

Our targeted audience is PNW user communities who stand to gain real benefit from NANOOS data products. Ongoing outreach and engagement have shaped the five high-priority, PNW use-defined topical areas for NANOOS: a) maritime operations; b) coastal hazards; c) fisheries and marine life; d) marine ecosystems, including PNW hypoxia, ocean acidification (OA), and Harmful Algal Blooms (HABs); and e) weather and climate. These topics are intimately linked to the economy, health, resiliency, and ecology of the region; hence efforts in these areas benefit society in the PNW and beyond. We connect to our users and stakeholders to assess requirements, deploy and maintain observations, deliver products, and reconnect on needs unmet. NANOOS follows the Framework for Ocean Observing model [2] and a stakeholder driven process [3] to maximize benefits while maintaining communication iteratively. NANOOS relies on its history of two-way engagement with PNW user groups, as expressed in the Letters of Support from a wide variety of organizations, marked with an asterisk (*) in our text.

NANOOS established these priority topic areas in its formative years and has regularly sought input to ratify relevancy, user requirements, and assess how well needs are being met. Input comes from two main sources: 1) we seek input formally from our GC during our annual in-person meeting; and 2) we interact directly with our stakeholders, users, and collaborators throughout the year via on-going engagement and partnership. This involves online recorded training webinars (e.g., how to use a specific app or find data), attending and speaking at user-based conferences, tradeshows, and workshops, following up on comments submitted via our website and apps, and reaching to specific user groups to test a new feature or app. Some of our NANOOS implementers, such as state or tribal agencies, are also our users or play vital roles on our operational standing committees, thus feedback interactions are direct, frequent, and two-way. **Objectives 1, 6, 8, and 9** support our ability to do this work. Below for each priority topic area, we detail the primary benefits, audience, and specific NANOOS partners, with examples of our tailored products and the specific objectives (Obj) that support them.

Maritime Operations: NANOOS provides water, wave, and weather observations and forecasts to ship and boat operators for **safe operations and planning** (**Obj 2, 3, 4, 7**). Both commercial maritime operations and recreational boaters benefit from NANOOS tailored apps: MaritimeOps and Boaters based on our coastal and estuarine observing assets and models to understand current conditions and plot safe routes. **Audience:** Commercial Port Authority offices in Puget Sound, the Columbia River estuary, and along the coast, coast and bar pilots, regional USCG coastal stations, numerous boating organizations, and boaters of all types. ***NANOOS partners engaged in this area include*** US Coast Guard District 13, Maritime Exchange of Puget Sound*, Merchants Exchange of Portland, OR*, Ports of Seattle, WA, Newport, OR, and Neah Bay, WA, Columbia River Bar Pilots*, Council of American Master Mariners, Puget Sound Harbor Safety Committee, National Association of Safe Boating Law Administration, Pacific Northwest Waterways Association*, Maritime Blue*, Oregon Dungeness Crab Commission*, Quinault Indian Nation*, Quileute Tribe*, and Canadian Integrated Ocean Observing System (CIOOS)* .

Coastal Hazards: NANOOS provides observations and analysis of topographic beach profiles, shoreline change, nearshore bathymetry, sea level change, and waves **to improve planning and response to coastal hazards, to assist with engineering design, to enhance coastal resiliency, and to track local shoreline change in coastal communities** (**Obj 5, 7**). Focused NANOOS apps to aid these efforts include Tsunami Evacuation and Beach and Shoreline Changes based on our shoreline observations and models. **Audience:** WA and OR natural resource departments, FEMA, USACE, USGS, local government planners, geotechnical engineers, shipping interests, and the public-at-large. ***NANOOS partners currently engaged in this area include*** OR Department of Geology and Mineral Industries, WA Department of Ecology, OR Department of State Lands, OR Parks and Recreation Department*, OR Sea Grant, Cascadia Coastlines and Peoples Hazards Research Hub, OR Coastal Management Program*, Emergency Volunteer Corp of Nehalem Bay*, and WebCOOS.

Fisheries and Marine Life: NANOOS' forecasts and data on the biophysical environment **permit better-informed management decisions by fishers (from tuna fishers to shellfish growers) and regional managers** (**Obj 3, 4, 7**). NVS apps tailored to Tuna, Salmon, and Crab Fishers, and Shellfish Growers are used for business decisions that sustain PNW economies. We are part of a west coast-wide network for acoustics and animal tracking to expand the knowledge of biodiversity and the number of stakeholders involved. **Audience:** OR, WA, and CA health and natural resource departments, tribal governments and enterprises, aquaculture companies, academic researchers, and shellfish trade associations. ***NANOOS partners currently engaged in this area include*** NOAA Northwest Fisheries Science Center/ NOAA California Current Integrated Ecosystem Assessment/U.S. West Coast Changing Ecosystems and Fisheries Initiative (NOAA NWFSC plus)* , NW Indian Fisheries Commission*, Quileute Tribe*, Port Gamble S'Klallam Tribe, Quinault Indian Nation*, Makah Tribe*, Hoh Tribe, Columbia River Inter-Tribal Fish Commission, Nez Pierce Tribe*, Confederated Tribes of the Umatilla Indian Reservation*, Confederated Tribes of the Coos, Lower Umpqua and Siuslaw Indians, WA Department of Fish and Wildlife*, OR Department of Fish and Wildlife, Lower Columbia Estuary Partnership*, Columbia River Inter-Tribal Fish Commission, Pacific Coast Shellfish Growers Association*, PNW Salmon Center, Hakai Institute, Pacific Shellfish Institute, Oregon Dungeness Crab Commission*, Columbia River Crab Fishermen's Association, Maritime Blue*, Puget Sound Restoration Fund*, and Puget Sound Partnership*.

Marine Ecosystems: NANOOS provides time-series and real-time observations and data products used **to evaluate, and in some cases forecast, HABs, hypoxia, marine heatwaves, ocean acidification, and water quality** (**Obj 3, 4, 7**). Stakeholders actively view real-time conditions, model projections, and risk evaluation from various tailored products including: NVS Explorer, a HAB Real-time data app, the PNW HAB Bulletin, a water quality app for Shellfish Growers, and NANOOS theme pages on marine heatwaves, hypoxia, OA, and HABs. **Audience:** U.S. EPA, PNW Tribes, OR, WA, and CA natural resource, environmental quality, and ecology agencies; and local/county resource divisions. ***NANOOS partners currently engaged in this area include*** NOAA Pacific Marine Environmental Lab (PMEL)*, NOAA NWFSC plus*, Olympic Coast National Marine Sanctuary*,WA Department of Ecology, WA Department of Health, WA Department of Fish and Wildlife*, OR Department of State Lands, OR Dungeness Crab Commission*, Hakai Institute, CIOOS*, Ocean Networks Canada, Makah Tribe*, Puget Sound Partnership*, Puget Sound Restoration Fund*, Pacific Coast Shellfish Growers Association*, Lower Columbia Estuary Partnership*, Columbia River Inter-Tribal Fish Commission, Nez Pierce Tribe*, Confederated Tribes of the Umatilla Indian Reservation*, NW Indian Fisheries Commission*, Northwest Indian College, Quileute Tribe*, Pt. Gamble S'Klallam Tribe, Quinault Indian Nation*, Rockland Scientific, Seabird Scientific*, Western Assn Marine Labs, Seattle Aquarium, Taylor Shellfish Farms*, Surfrider Foundation, Nature Conservancy, Sound Water Stewards, and Marine Resources Advisory Committee*.

Weather and Climate: All NANOOS-funded real-time buoy data (meteorological, oceanographic, waves) are transmitted to the National Weather Service's Advanced Weather Interactive Processing

System (AWIPS) and **used by forecasters to create weather predictions and issue warnings** (**Obj 2, 3, 4, 7**). Additionally, NANOOS provides climatology and anomaly products from regional buoy and satellite time series **to improve understanding of climate variation and change**. Our NVS Averages and Anomalies app provides context and a greater understanding of current conditions relative to long-term means to interpret the coastal climate signal. **Audience:** WA and OR natural resource managers, tribes, local government planners, and the public-at-large. ***NANOOS partners currently engaged in this area include*** Weather Forecast Offices in Seattle and Portland, NOAA PMEL*, NOAA NWFSC plus*, Olympic Coast National Marine Sanctuary*, CIOOS*, Puget Sound Partnership*, WA Department of Ecology, OR Department of State Lands, Lower Columbia Estuary Partnership*, Pacific Coast Shellfish Growers Association*, Pacific Northwest Waterways Association*, Columbia River Inter-Tribal Fish Commission, Northwest Indian College, Pt Gamble S'Klallam Tribe, Quileute Tribe*, Quinault Indian Nation*, Makah Tribe*, Surfrider Foundation, Nature Conservancy, SeaBird Scientific*, and Western WA University*.

d) Approach & e) Benefits

NANOOS proposes to sustain its core capabilities, entrain emerging capabilities funded through the Inflation Reduction Act (IRA), and strategically enhance our system according to regional user needs. With recent Infrastructure Investment and Jobs Act (IIJA) funding, NANOOS replaced and modernized many of its observing assets and updated its DMAC and modeling infrastructure. These investments have created a more resilient NANOOS, ready to serve our PNW community into the future. Our approach for the next five years sustains the expert personnel, infrastructure, and user-engagement behind established NANOOS datasets and data products. We aim to maintain valuable long-term records in these highly variable coastal waters and real-time decision support tools. For IRA, we primarily added new sensing capabilities to existing observing assets, extended the geographic extent of established observing projects, or built a new data product or app within the NVS environment. We will aim to leverage and maintain our IRA work as much as possible. As funding allows, we will pursue select enhancements to our system guided by regional needs and national priorities, including enhancing biological and acoustic observations, expanding HFR to the Strait of Juan de Fuca, and enhancing the popular J-SCOPE model. All NANOOS activities are organized by project in the subsystems sections below.

Our approach is based on our GC and EC deliberations, informed by stakeholder input, and balances investments across the five NANOOS topic areas and two states. They recommended we maintain NANOOS as the PNW regional arm of the U.S. IOOS; strengthen existing infrastructure and capacity, assuring reliability; and make selective increases in our capabilities in strategic topical areas dictated by our regional users. Our 23 projects and budget were approved by our EC. Taken as a whole, NANOOS projects address all five PNW stakeholder-defined topical areas, which map to the seven IOOS societal benefits (weather and climate; maritime operations; coastal hazards; national security; public health; ecosystem health; natural resources). Our regional objectives and activities complement and comply with the U.S. IOOS Strategic Plan and many other topical national plans as referenced in the sections below. As we add new capabilities related to biological observations, we look to the ATN Implementation Plan and the MBON and BIO Task Team Strategies for guidance.

1. Governance and Management Subsystem

Objective 1. Maintain NANOOS as the U.S. IOOS PNW Regional Association

NANOOS has designed and implemented PNW IOOS infrastructure since 2003. We propose to sustain NANOOS, continuing its successful >20-year-old governance and management structure comprised of: 1) a Governing Council (GC) of representatives from member (MOA-signatory) institutions; 2) a decision-making Executive Committee (EC) composed of a Board of 17 elected GC members from diverse sectors, the Governing Council Board Chair (Barnard, OSU) and Vice Chair (Kosro, OSU), the

Executive Director (PI Newton, UW-APL), and the Chairs of the three NANOOS standing committees: DMAC (Travis, UW-APL), User Products (Tanner, UW-APL), and Engagement (Wold, UW-APL); 3) an Executive Director (PI Newton, UW-APL) and Deputy Director (Co-PI Carini, UW-APL) for project vision, oversight, and implementation; and 4) distributed partner PIs who execute the subsystems of NANOOS. For this and previous proposals, UW acts as the fiscal authority on behalf of NANOOS, entering legally binding agreements, receiving and disbursing funds, and ensuring fiscal accountability.

NANOOS will engage its GC, with representation from numerous sectors (20% local, state, and federal government, 8% tribes and tribal organizations, 23% NGO/education organizations, 27% industry, and 22% academic institutions) and a regionally equitable distribution, to define and refine its regional priorities. Annual GC meetings are used to identify priorities, potential new members, and deficiencies. The EC provides an agile yet still representative advisory body for NANOOS. They hold decision-making authority on annual budgets and other prioritization decisions.

NANOOS will continue to play a vital regional coordination role, both within the PNW and along the west coast. For the PNW, NVS serves over an order of magnitude more data streams than we financially support and we will continue this role for coordination and assistance with key regional issues. NANOOS will cooperate extensively with other RAs, co-hosting workshops, sharing competencies, and strategic planning, as well as to serve national cohesivity and strategic delivery of coastal information.

NANOOS will continue to participate actively with the U.S. IOOS Program Office, regularly attending semi-annual meetings and other IOOS activities. NANOOS is a member of the IOOS Association, on whose Board Barnard and Newton sit; Newton currently serves as Vice Chair on its Executive Committee. In 2028, NANOOS will seek recertification as a Regional Information Coordination Entity of the U.S. IOOS. NANOOS was originally certified in 2018 and recertified in 2023.

Project 1: Governance Activities

Newton and Carini will be accountable to the NANOOS GC and its elected EC. They will hold the annual GC-PI Meeting, bi-monthly EC Meetings, and an annual TriCom Meeting for the three operational committees to set annual priorities and to assure that NANOOS governance is executed in accordance with the NANOOS Memorandum of Agreement and involves NANOOS membership and regional users in the products and decisions of NANOOS. They will participate in IOOS and IOOS Association meetings and national and regional meetings of relevance representing NANOOS and IOOS.

Project 2: Program Management & Fiscal Administration

Newton and Carini will interact with the co-Principal Investigators (PIs) to assure implementation of the projects described here, as funds allow. On an operational basis, they will coordinate with Observation, DMAC, Modeling, and Engagement (& User Product Development) subsystem leads to assure efficient and effective procedures are used to run NANOOS. They will assure the selection of chairs of NANOOS' operational committees (DMAC, User Products, Engagement) and meet with them weekly to guide implementation of NANOOS in a way that includes user input iteratively. They will file all reports and requests for information and oversee completion of all milestones in our Milestone Schedule. They will work with UW-APL Fiscal Administrators to ensure all pre- and post-award actions are completed in a timely manner and in accordance with all relevant UW and sponsor protocols.

Benefits: Collectively, Projects 1-2 along with Projects 14-16 and 21-23 will allow the functionality of NANOOS to continue, as implemented through specific observing and modeling projects below, benefiting the entirety of the NANOOS region including those who wrote compelling Letters of Support about their uses and benefits from NANOOS. We will work with specific users (see "NANOOS partners engaged" in Audience section) to co-develop, implement, and then reassess how well the data, information products, and delivery systems are addressing needs. NANOOS will connect with identified user groups, work to understand information needs, and then iteratively work with users to develop and enhance information

delivery. Easy to use "Comment" intake forms on our website, NVS, and other products allow for immediate feedback. Our governance structure is regularly used to seek input on our proposed work.

2. Observing Subsystem

We propose to sustain and enhance observing assets within three observational domains: coastal ocean, estuaries, and shorelines. The NANOOS Conceptual Design (Figure 1) shows the distribution of existing and proposed observing assets, which derives from the NANOOS Build-Out Plan, our Certification Strategic Operating Plan, and ongoing stakeholder input as evaluated by the NANOOS Governing Council. Of the 34 IOOS Core Variables, 30 apply to the PNW region. NANOOS directly funds the observation of 17 of those variables: bathymetry, currents, heat flux, salinity, surface waves, temperature, wind speed and direction, acidity, colored dissolved organic matter, dissolved nutrients, dissolved oxygen, optical properties, partial pressure of carbon dioxide, contaminants, total suspended matter, phytoplankton abundance and distribution, and zooplankton abundance and distribution. We serve an additional four IOOS Core Variables through NVS: ocean color, sea level, stream flow, and bottom character. Therefore, NANOOS delivers regional information for 21 out of 30 (applicable) IOOS Core Variables.

The NANOOS Observing Subsystem provides infrastructure and data that are part of the national backbone of coastal ocean observing. For example, surface currents from our high frequency radar network and glider data from seasonal and year-round missions are sent to their respective national data assembly centers (DAC), and our coastal moorings routinely host sensors for NOAA's Ocean Acidification Program (OAP). We transmit all oceanographic and meteorologic buoy data to the National Data Buoy Center (NDBC) and the World Meteorological Organization-Global Telecommunications System (WMO-GTS) for widespread use, especially related to marine forecasting and operational model validation, and we archive data at the National Center for Environmental Information (NCEI).

Objective 2. Maintain and enhance surface current and wave observations

Project 3: Surface Current Mapping using High-Frequency Radar

Over the past 5 years, NANOOS has filled gaps along the WA coast, in accordance with the National Surface Current Mapping Plan. We propose to continue operation of 13 CODAR SeaSonde high-frequency radar (HFR) systems (8 long-range and 5 standard-range) that provide surface current mapping along the Pacific Northwest coast, covering the majority of coastline in WA and OR, with overlap in northern California (PI Kosro, OSU). This system produces individual hourly-averaged and 25-hourly averaged radial current measurements which are transmitted to the IOOS HFR DAC in near-real time. Data quality is assured through implementation of the IOOS Monitoring and Maintenance Checklist for: CODAR Ocean Sensors SeaSonde HFR Systems [draft]. Vector current maps are made available through NVS and used by a wide array of stakeholders. As funding allows, NANOOS proposes to add one (up to three) HFR system(s), placed strategically in the Strait of Juan de Fuca (PI TBD). Canadian IOOS (CIOOS) Pacific and Ocean Networks Canada have two HFR stations along the south shore of Vancouver Island. Sharing data across our border would extend surface current mapping along nearly the entirety of the Strait.

Benefits: Societal benefits of the HF Radar data and production of various products to the community include: safe navigation [4], US Coast Guard search-and-rescue, NOAA's Office of Response and Restoration oil spill and pollution response, ecosystem analysts tracing transport of HABs, fishermen and other ocean users for route planning, the US Weather Service through AWIPS, field scientists for operational planning, and ocean modelers for data assimilation to improve their model fidelity. Radars in the Strait of Juan de Fuca will enhance public safety and further increase the economic output.

Project 4: Waves at the Port of Newport using X-band Marine Radar

NANOOS has invested in an X-band marine radar wave observing station at the U.S. Coast Guard (USCG) Yaquina Bay Station in Newport, OR, since 2009. The station provides continuous (updated every 15-min),

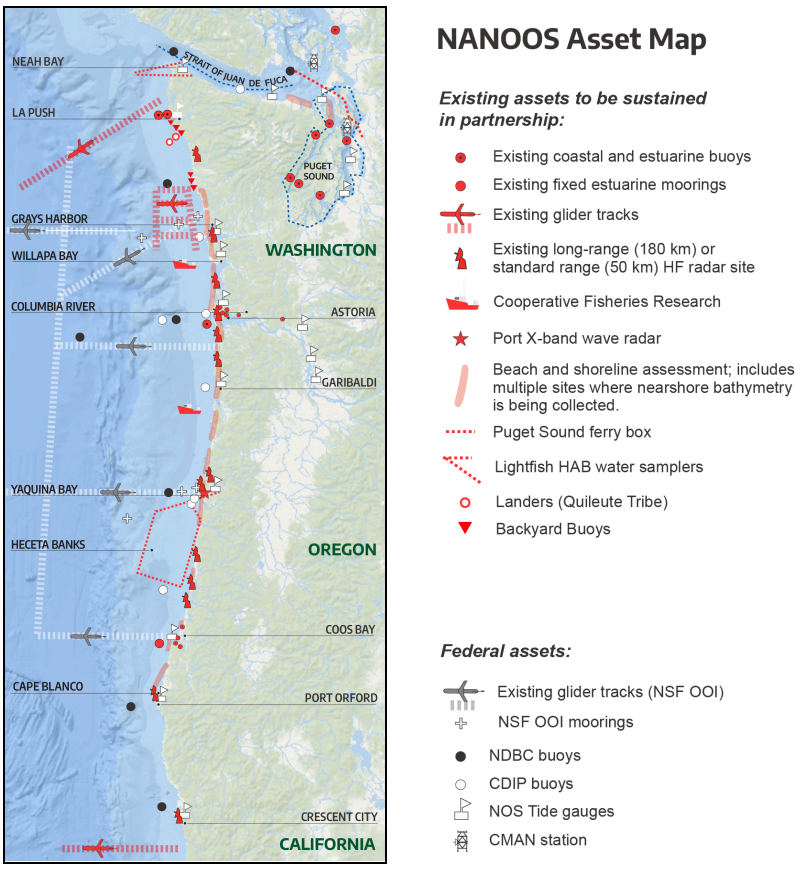

Figure 1. NANOOS Asset Map. Existing and proposed assets to be sustained by NANOOS and partners are shown in red. Federal assets served on NVS by NANOOS are shown in gray/white.

high-resolution wave information at the entrance to the Port of Newport. There are no other existing sources of wave data local to the area. We propose to maintain and operate the system, and perform data quality assurance and quality control of all data products available on NVS (PI Haller, OSU). To improve system resilience, we will conduct updates to the radar operation and data collection software suite and continually refine the data-processing workflow. These improvements will increase reliability, reduce data gaps, and strengthen remote monitoring capabilities. As funding allows, we will add new and improved data products to increase the value of the observing station for end users, including operationalizing the existing radar-derived bathymetry algorithm for routine (non-real-time) updates, development of a course-resolution current estimation product, and a wave height estimate product. Potential obstacles include delays in the current repair of the USCG tower and intermittent radar component failures. These risks will be mitigated by using the mobile tower for interim operations (until USCG tower repair is completed) and maintaining a set of critical spare parts for rapid replacement, made possible by IIJA funding.

Benefits: There is critical potential pay-off to save lives at dangerous bar crossings, including the local commercial fishing fleet, pilot operations, recreational boaters, and the USCG navigating the Yaquina Bay Entrance [5]. The project is conducted in close partnership with the USCG, who provide site access and tower support. Beneficiaries include the USCG, commercial fishing vessels, and recreational mariners who routinely transit the Yaquina Bay entrance. Our radar-derived products, co-designed with users, provide situational awareness that has proven useful in multiple USCG marine accident investigations.

Project 5: Backyard Buoys: Community-stewarded Coastal Wave Observations

NANOOS will sustain Backyard Buoys (BB) as part of its Core capabilities (PI Carini, UW-APL). BB wave observations began with NSF Convergence Accelerator funding [6] and included two community implementers in the PNW, the Quinault Indian Nation and the Quileute Tribe. Both partners have deployed three Sofar Spotter wave buoys off their coast, partially filling gaps in the nearshore region of WA identified in the National Operational Wave Observation Plan. Through IRA Topic 2 funding, NANOOS is working to sustain engagement with these two partners and to expand to several other tribal partners in WA and OR. We are also conducting outreach to coastal fishing and yacht clubs and Marine Conservation Areas as potential partners. By the end of our IRA grant, we anticipate having six or seven BB partner communities operating 10 Spotter buoys (wave height, wave period, wave direction, and sea surface temperature) and two Smart Moorings (wave data with additional bottom dissolved oxygen). We propose to sustain BB baseline operations and maintenance to support these community-implemented wave buoy observations. This includes ongoing engagement, conducting in-person mooring assembly and deployment/recovery trainings to build capacity within communities, maintaining the BB data management infrastructure (BB database with API and BB ERDDAP that enables data transmission to NDBC and the GTS), and maintaining the data access tools (deployment management dashboard, mobile apps, and text-a-buoy). As funds allow, we will co-design new features for the BB mobile app. The NANOOS BB team will continue to participate in national IOOS working groups related to waves and coastal hazards to share lessons learned and best practices across the RAs.

Benefits: The hyperlocal wave data enabled by Backyard Buoys is invaluable to local communities and benefits from years of co-design and refinement. The data fill critical gaps in wave information that help fishers make safer decisions about when to go out on the water.

Objective 3. Sustain and enhance buoys and gliders in the PNW coastal ocean, in coordination with national and regional programs

Project 6: Ecosystem Observations from Shelf Buoys

NANOOS maintains shelf moorings in three locations along our PNW coast in alignment with the National Strategy for a Sustained Network of Coastal Moorings: northern WA, Columbia River Plume, and southern OR. Each station provides meteorological (air temperature, barometric pressure, wind speed and direction) and oceanographic measurements (temperature, salinity, density, dissolved oxygen, and chlorophyll) to monitor shelf conditions for hypoxia, marine heat waves, and ocean acidification. Data from all these shelf buoys are available in near-real time on NVS, archived on the NANOOS ERDDAP, sent to NDBC, and archived with NCEI at regular intervals. See our Data Management Plan for details. In addition to maintaining these, NANOOS will help other regional assets with developing real-time data transmission, such as for the Olympic Coast National Marine Sanctuary who we are already partnering with.

The Cha'ba buoy and NEMO subsurface profiling mooring (PI Mickett, UW-APL), located off La Push, WA, have been the cornerstone of WA Shelf real-time and long-term monitoring since they were established in 2010. The CB-06 buoy (PI Kosro, OSU), located off Coos Bay, OR, has been a strategic priority for NANOOS since 2007, complementing the long-term NSF Ocean Observatories Initiative along the Newport Hydrographic line (NH-10). In addition to the standard variable listed above, the WA and OR buoys both include subsurface velocity measurements and are critical infrastructure for NOAA OAP, hosting pCO_2 (air and water) systems and several pH sensors [7], which support the Strategic Plan for Federal Research and Monitoring of Ocean Acidification. The multi-depth SATURN-02 buoy (PI Gradoville, CRITFC) has been deployed seasonally since 2008 to monitor the conditions within the Columbia River plume, a major driving influence on coastal waters [8].

We propose to maintain year-round operations of Cha'ba and CB-06 with spring and fall servicing cruises. The NEMO subsurface and SATURN-02 moorings are deployed each spring and recovered each

fall to avoid losses during winter storms. In addition to routine servicing, we will conduct calibration, QA/QC, antifouling, radio network maintenance, and equipment replacement as needed to support reliable, high-quality data streams. IIJA funding has enabled recapitalization and modernization of these moorings, including the hardware, controllers/electronics systems, and met/ocean sensors. Additionally, IRA funding will extend near-real time data transmission for Cha'ba from summer only to year-round. We will sustain this capability through NANOOS Core funds.

Benefits: Benefits are widespread; reported uses include: Cha'ba and NEMO observations allow tribal (Quinault, Quileute, Hoh, Makah), state (WA Dept. of Ecology, Health) and federal (Olympic Coast National Marine Sanctuary, Olympic National Park) coastal resource managers to make informed, timely decisions for fisheries management, human health/safety, or to mitigate stressor impacts to marine resources. SATURN-02 users include NOAA NMFS, OR Department of Fish and Wildlife, restoration practitioners (Lower Columbia Estuary Partnership, Columbia Land Trust, Pacific States Marine Fisheries Commission) to understand ocean conditions [9, 10, 11, 12], and Columbia River Bar Pilots, who use these observations to understand local wind and water conditions relevant to navigation and operations [13]. CB-06 near-real time data are used by sailors, fishermen to aid marine navigation, USCG for search and rescue, NOAA ORR for spill-tracking, and by many for tracking HABs, interannual variability (e.g. ENSO) and marine heat waves. Velocity on NEMO and CB-06 aid USCG search and rescue, and when combined with dissolved oxygen or chlorophyll data, help managers predict the movement of hypoxic waters or potential harmful algal blooms, respectively. All observation data also contribute to data-assimilative models used for weather forecasting and are used to calibrate and validate regional hydrodynamic modeling efforts, which then support regional decision-making by managers, non-profits, and communities.

Project 7: Ecosystem Observations from Shelf Gliders

NANOOS sustains three glider lines in the PNW, all collecting temperature, salinity, density, dissolved oxygen, chlorophyll fluorescence, colored dissolved organic matter fluorescence, and optical backscatter. Between the NANOOS glider lines and NSF OOI glider lines (assuming they resume operations), the PNW coastal waters are well-sampled, in agreement with the IOOS Underwater Glider Network Plan. Glider data is transmitted in near-real time to the IOOS National Glider DAC and displayed on the NVS Autonomous Vehicle web app. The full resolution, quality-controlled datasets are transmitted to the national DAC in delayed mode and then automatically sent from the DAC to NCEI for archive.

The La Push glider line in northern WA conducts repeated, persistent, and year-round occupations from 47°52'N, 125°10'W to 47°00'N, 127°00'W (~170 km) using three long-endurance SGX Seagliders (PI Rainville, UW-APL). The Trinidad Head (TH) glider line is jointly supported by NANOOS and CeNCOOS and conducts repeated, persistent, and year-round occupations from 41 3.5'N, 124°22'W to 41 3.5'N, 129°00'W (~490 km) using two long-endurance SGX Seagliders (PI Barth, OSU). Along these two lines, gliders profile from the sea surface to 1000-m depth, collecting data to characterize physical and biogeochemical variability over the shelf-slope system offshore of WA and near the OR-CA border at timescales ranging from weeks to inter-annual. These observations connect the coastal regions, the focus of other NANOOS components, with the deep basin, which is well-sampled by the Argo float array. Gliders along both La Push and TH lines are "hot-swapped" at sea approximately every six months to maintain continuous sampling. Under IRA funding, we are working to add pH and nitrate to the La Push and TH gliders, in line with the community strategy described in the 2024 Underwater Glider User Group (UG2) Workshop Report. Once fully tested, NANOOS will support the continued operations and maintenance of these new sensors via Core funds.

The Central WA Shelf glider line conducts a north to south zigzag pattern to map ocean properties off Grays Harbor and the Quinault Indian Nation using two 200-m capable Teledyne Marine Slocum gliders (PI Barth, OSU). By the end of IIJA, both gliders will be upgraded to the manufacturer-required G3 model.

The glider sampling plans are coordinated with CRITFC and the Quinault Indian Nation. The mapping surveys will take place in spring (May/June) to measure the properties of upwelling source water at the beginning of the upwelling season. A second survey will be done in July and a final survey in September at the end of the summer upwelling season, coinciding with the historic time of most intense shelf hypoxia. Modelers at CRITFC will make use of the glider data to verify and improve their numerical models of the region. Both the Quinault Indian Nation and the member tribes of CRITFC have interest in better understanding ocean conditions as they affect tribal fisheries. Under IRA funding, we are adding coded acoustic tag VEMCO sensors to the WA Shelf glider line to help track salmon and other fish. These data will be transmitted to the Northeast Pacific Acoustic Telemetry (N-PAcT) node, funded under IRA, for archive and distribution to the acoustic tagging research community in accordance with National ATN Recommendations. Also, as funds allow, a Passive Acoustic Monitoring (PAM) hydrophone will be added to the WA Shelf gliders to record ocean noise levels and to detect the presence of marine mammals. For this, we will work with existing OSU acoustics experts and participate in national PAM working groups.

Benefits: The glider-measured upper-ocean heat content (related to sea-level change at the coast), dissolved oxygen, and pH all contribute to improving predictions of ocean and weather conditions and their effects on coastal communities and the nation. Upper-ocean heat content of the US west coast has been related to temperature and humidity levels inland and measurements at sea are key for verifying and assisting numerical ocean circulation and weather models [14]. As the duration of the time series of NANOOS observations from autonomous gliders along the WA and OR Coasts approaches 20 years, the proposed effort also includes the creation of a climatology of the annual and seasonal cycle for each variable, complementing similar efforts along the California Coast [15]. Glider-measured subsurface density fields and depth-averaged currents are important to data-assimilating ocean circulation models for making accurate forecasts of ocean currents for improving marine operations. Passive Acoustic Monitoring from gliders has the potential for improving maritime operations; knowledge of the proximity or absence of marine mammals would help marine operations proceed efficiently and safely.

Objective 4. Maintain and expand multidisciplinary observational capabilities in PNW estuaries and the nearshore, in coordination with local and regional programs

Project 8: Ecosystem Observations from Estuarine Moorings

NANOOS' estuarine observing effort is concentrated in two PNW estuaries of large economic and ecological footprints (Puget Sound and Columbia River), and in South Slough/Coos Bay, a National Estuarine Research Reserve System (NERRS) site in southern OR. These efforts informed and continue to follow the National Coastal Ecosystem Moorings Workshop guidance. Though configurations vary, most moorings measure temperature, salinity, pressure, chlorophyll, colored dissolved organic matter, particles, optics, and dissolved oxygen; many moorings additionally measure nitrate, pH, and pCO_2. Moorings with surface components measure wind speed and direction, solar radiation, and air temperature. For all estuarine systems, we will conduct routine servicing, calibration, QA/QC, antifouling, radio network maintenance, and equipment replacement as needed to support reliable, high-quality data streams. Data are processed in near-real time and published to the NANOOS ERDDAP server, NVS, and, when appropriate, to the NDBC for GTS distribution.

The Oceanic Remote Chemical Analyzer (ORCA) Mooring Network has been part of the Puget Sound observational system for more than two decades (PI Travis, UW-APL). The ORCA program consists of six profiling moorings: Main Basin near Point Wells, South Sound at Carr Inlet, Admiralty Inlet near Hansville, Hood Canal in Dabob Bay, near Hoodsport, and near Twanoh. These are undergoing a multi-year redesign (funded by Congressional earmark), transitioning from a winched CTD system to a new buoyancy-driven float design to improve reliability; so far, two of the six are completed. Additionally, two ORCA stations are equipped with pCO_2 systems maintained by the PMEL Carbon Group as part of their

ocean acidification (OA) Monitoring Network. NANOOS also supports a seventh non-profiling mooring in Puget Sound, called Se'lhaem, in Bellingham Bay in partnership with the Northwest Indian College.

The Coastal Margin Observation and Prediction (CMOP) Program currently consists of four stations in the lower Columbia River estuary: Tongue Point multi-depth station (SATURN-04), the Baker Bay (SATURN-07), Youngs Bay (SATURN-09), and Cathlamet Bay (CBNC3) estuary buoys (PI Gradoville, CRITFC). CMOP's multi-depth Point Adams station (SATURN-03), which operated for 16 years at this location, was lost in November 2025 when the host facility closed, eliminating access to the pier-based platform and creating a gap in monitoring at the estuary entrance. As funds allow, we will design and deploy a replacement multi-depth buoy near the river mouth. We would also reoccupy Elliott Point station near the upper limit of salinity intrusion, which has longer residence times than in the lower estuary [16], and untested potential for bottom-water hypoxia. CRITFC will also evaluate biological monitoring technologies, such as environmental DNA, imaging systems, acoustics, or other tools, in coordination with NANOOS partners and the IOOS network, based on feasibility and relevance to Tribal and regional priorities. Selected approaches will be piloted and refined prior to potential integration into sustained operations.

NANOOS support enables near-real time data transmission from five water quality stations and one meteorological station located within the South Slough National Estuarine Research Reserve (SSNERR): Charleston Bridge, Valino Island, Winchester Creek, Elliot Creek, Tom's Creek marsh, and North Spit (PI Helms, ODSL). Currently, there are over thirty years of time-series water quality measurements and twenty-five years of meteorological measurements that continue to provide valuable baseline environmental conditions for short-term variability and evaluating long-term change in estuarine habitats. As funds allow, ODSL will help SSNERR to update their sensors and telemetry systems, and to conduct more analysis characterizing estuarine nutrient dynamics.

Benefits: Estuarine data improve understanding of how coastal upwelling affects estuarine conditions, supporting evaluation of ocean-driven variability in water quality such as hypoxia, OA, salmon habitat during early marine transition, and thermal stress. Users of these observation data include federal, tribal, state, and local managers and many others, noted in our Audience section for Marine Ecosystems. Maintaining long-term established datasets [17] allows comparison of status and trends in environmental conditions, investigating factors contributing to change in estuarine water quality dynamics, and contributing to protection and restoration of estuarine wetland habitats and species. Observation data are used to calibrate and validate regional hydrodynamic models, supporting regional decision-making by agencies, tribes, non-profits, and communities. Biological observations will improve understanding of biodiversity and plankton community structure, supporting detection of ecosystem stressors, shifts in food-web structure, and strengthen links between physical and biogeochemical drivers and ecosystem responses.

Project 9: Ecosystem Observations from Estuarine Ferry Boxes

Complementing these fixed estuarine assets is NANOOS support for two ferry-box systems in the Salish Sea, both in operation for over a decade (PI Kaminsky, WA Ecology). Regularly scheduled sailings of state- and privately-operated ferries provide unique opportunities to expand monitoring efforts beyond geostationary long-term station networks at relatively low cost. Ferry-based instrument packages are used to (a) monitor circulation in a critical reach of the estuary that regulates physical exchange between Puget Sound and the Strait of Juan de Fuca (WSDOT) and (b) characterize the evolution of surface water quality parameters along an 80-mile transect between Victoria, BC and Seattle, WA (Victoria Clipper). As funds allow, we will add underway pCO_2 monitoring, improve data transmission and cloud-based repositories, and develop pathways to share this data via NVS.

Benefits: These data will provide critical information needed for a) evaluation and study of tidal energy potential within the Salish Sea, and b) improving simulations and advancing understanding of regional water quality and estuarine circulation in response to meteorological conditions, climate variability,

and terrestrial hydrological cycles. End users of these proposed products will be regional hydrodynamical and biogeochemical modelers (including LiveOcean and the Salish Sea Model), and regulatory agencies.

Project 10: Harmful Algal Bloom (HAB) Observations: PNW Bulletin components & SoundToxins

NANOOS prioritizes measuring and forecasting HABs and has received directed National Harmful Algal Bloom Observing Network (NHAB-ON) funds to do so. We include HAB activities here as they are a high priority; if NHAB-ON funding continues, we will reallocate to additional HAB or other biological monitoring.

The PNW HAB Bulletin provides timely short-term forecasts of risk of a domoic acid event to coastal shellfish managers throughout WA and OR as part of the NHAB-ON (Framework and Strategy). Tailored risk forecasts are communicated in the form of the PNW HAB Bulletin, a short two-page document composed of data graphics and concise summary and forecast statements (PI Mordy, UW) [18]. Six to eight Bulletins would be produced and delivered to managers throughout a typical year. NANOOS also will support several contributions to the PNW HAB Bulletin, including nearshore water sampling activities with WA Coastal Treaty Tribes (PI Trainer, UW-ONRC), deployment of an autonomous surface vehicle to collect water samples in WA and OR (PI Mickett/Trainer/Bolm, UW-APL/UW-ONRC/OSU), implementation of a Cooperative Fisheries Research program where fishers collect water samples that are processed in the lab for species and toxin levels (PI Kavanaugh/Trainer, OSU/UW-ONRC), and particle trajectory forecasts from the LiveOcean model (PI Hewett, UW-APL). These components represent long-standing efforts and some new IRA-funded expansions, which NANOOS intends to sustain, as funds allow.

Benefits: The PNW HAB Bulletin, available on NANOOS web, provides a synthesis of observed and modeled information specific to the HABs that affect the coastal razor clam harvest. Managers from WA and OR rely on the Bulletin as they make decisions to close or open the harvest. The coastal communities depend on the tourists that come for the recreational harvest, yet human health is the highest priority. Regular meetings are held to discuss toxin status and how well the forecast did.

NANOOS supports SoundToxins, a WA Sea Grant phytoplankton monitoring program in Puget Sound, WA, designed to provide early warning of harmful algal bloom events to minimize both human health risks and economic losses for WA's fisheries (PI Litle, UW). NANOOS funds will help sustain communication with monitors, assistance in plankton identification, and alerts to state health officials about real-time concerning levels of harmful algae.

Benefits: Health officials at WA Dept of Health Biotoxins Program use data to refine toxin testing and make management decisions to protect public health and safety. This includes prioritizing toxin sample test order, requesting additional shellfish tissue samples, and assisting with emergency closure decisions. Shellfish growers use data to inform farm management decisions which can save time and money.

Objective 5. Maintain and enhance core elements of beach and shoreline observing

Project 11: Beach & Shoreline Monitoring

NANOOS has supported seasonal beach and shoreline surveys in WA (PI Kaminsky, WA Ecology) and OR (PI Allan, DOGAMI) for over 20 years. These surveys provide quantitative information on the morphological response of PNW beaches at various time scales, including seasonal (due to changes in waves and tides), interannual (e.g. storm-induced, El Niños), and long-term changes (e.g. sea level variability, shifts in storm frequency/magnitude, and interdecadal climate patterns such as the Pacific Decadal Oscillation [19]). They also provide improved knowledge of coastal hazards like erosion, flooding, and inundation, and help coastal resource managers make informed decisions [20, 21]. Beach monitoring is carried out using a variety of Real-Time Kinematic Differential Global Positioning System (RTK-DGPS) surveying techniques at low tide. NANOOS support specifically covers beach profiles at over 47 sites within the Columbia River Littoral Cell (CRLC) and 178 sites along the OR coast. This effort includes data collection, processing, and archiving, and all beach profiles and shoreline change data are

shared via the NVS Beach and Shoreline Changes web app. As funding allows, we will consider modest expansion of the current beach monitoring program in the following areas: storm-based event scale beach monitoring, routine monitoring in Puget Sound or additional sites in OR, and the inclusion of select CRLC resilience project monitoring data products to be served on the NANOOS NVS website. Data acquisition in these areas may be supported by drone-based data collection initiated with IRA funds.

Benefits: Mitigation of coastal hazards is facilitated through observations and analysis of topographic beach profiles, shoreline change, nearshore bathymetry, sea level change, and waves to improve planning and response to coastal hazards, to assist with engineering design, to enhance coastal resiliency, and to track local shoreline change in coastal communities. Users of these data include: state and county agencies for planning, coastal cities for dune management, coastal geotechnical consultants for site-specific geologic investigations, and federal agencies such as the Federal Emergency Management Association (FEMA) for coastal flood inundation and erosion mapping, and the U.S. Army Corps of Engineers for coastal change detection and monitoring of engineering structures.

Project 12: Nearshore Bathymetry Surveys

NANOOS supports annual nearshore bathymetric observations along the WA and OR coasts, delivering systematic, high-quality environmental measurements of the nearshore coastal zone, one of the most dynamic and societally critical environments in the PNW (PI Ruggiero, OSU). The work centers on the CRLC (220+ sites) and extends to selected littoral cells along the central OR coast (~50 sites). Surveys are conducted using a Personal Watercraft-based Coastal Profiling System, updated in 2024 via IIJA funding. Profiles span the lower intertidal zone from the beach to ~1500-2000 m from the shoreline, capturing the full active nearshore sand transport zone. All data are QCed and formatted with standardized metadata, and will be delivered to NVS for public discovery and visualization. They are archived annually with USGS ScienceBase. The resulting dataset is among the longest continuous nearshore bathymetric time series in the world, now spanning more than 25 years, and is actively used by federal agencies, state resource managers, coastal planners, and the research community. As funding allows, and in response to the USACE data users, we are planning on adding 30 cross-shore profiles extending our surveys further south in OR. We may work with regional research partners to characterize the influence of rocky reef structures on nearshore wave propagation, sediment dynamics, and beach morphology.

Benefits: The nearshore bathymetric time series is a primary data source for quantifying rates and patterns of shoreline and beach change at decadal timescales, providing bathymetric inputs required for coastal flood modeling used by FEMA, USACE, and state agencies, and informing adaptation planning by municipalities, counties, and tribal nations facing increasing coastal flood and erosion risk. Annual volumetric change calculations derived from surveys are a direct input to USACE Regional Sediment Management programs, informing dredging operations, material placement decisions, and long-term sediment budget analyses that affect maritime commerce, fishing industry access, and community safety.

Project 13: WebCOOS

NANOOS has benefitted greatly from its participation in the WebCOOS OTT Phase II project. We have installed seven cameras across five sites in WA and OR that provide immense value for coastal erosion management, safe recreational beach usage, and decision-support for marine navigation. As such, NANOOS is committed to continue supporting operations and maintenance of these stations beyond the OTT funding with Core funds (PI Carini, UW-APL). Through our NANOOS Engagement and User Products Development efforts, we will integrate the WebCOOS live video streams, beach change products, rip current detection, and beach usage products into existing and relevant NVS web apps.

Benefits: The seven cameras across five sites in WA and OR will provide immense value for coastal erosion management, safe recreational beach usage, and decision-support for marine navigation.

3. Data Management and Cyberinfrastructure (DMAC) Subsystem (includes UPC)

Objective 6. Maintain, harden, and enhance the NANOOS DMAC system for routine operational distribution of data and information

Project 14: Maintaining Certified Data Provider Status

NANOOS maintains a robust DMAC infrastructure to ensure all end users can discover, access, and understand the data we serve. This effort is led by our DMAC Chair, Travis (UW-APL). As a certified non-federal data provider, NANOOS meets federal standards for data gathering and management. In addition, we operate inclusively, transparently, and seek user input to determine system priorities. NANOOS was originally certified in 2018 and recertified in 2023, which means our data has the full backing of the U.S. IOOS and NOAA. We will undergo recertification again during this award period in 2028.

The NANOOS data pipeline provides for transmission of data from the observing asset's initial repository (e.g., PI data server or sensor manufacturer cloud server), to the NANOOS servers that feed the NANOOS ERDDAP and NVS. Once data is in the NANOOS system, we implement relevant QARTOD tests and build ERDDAP datasets that follow the IOOS metadata profile1.2 standards and CF-conventions for variable naming, ensuring that all data is formatted to allow for standardized dataset discovery. This also means the data are machine-readable and interoperable with AI/ML systems via standard Model Context Protocol (MCP) servers. Our NANOOS ERDDAP provides information about our regional datasets to the national IOOS Catalog; there are currently 102 datasets in our ERDDAP, and it continues to grow. From our ERDDAP, NANOOS-funded assets are also ingested in near-real time by NDBC, and subsequently sent to the GTS. Finally, we will maintain existing data archiving pathways to NCEI and will develop pathways for new dataset archiving. The pipeline described applies mostly to buoy, mooring, and shore station observing assets. For HFR and glider assets, data is transmitted directly from the observing platform to the appropriate national DAC and sent to NCEI from there. Additionally, the beach, shoreline, and bathymetry survey data are served through the NANOOS ERDDAP and sent to NCEI for archiving. We maintain a public Documents webpage that hosts Data Management Plans (DMPs) for each NANOOS-funded observing asset. Our proposal includes an overview of our NANOOS-wide DMP, which references the suite of documentation available on our website.

Project 15: Participating in National IOOS DMAC Activities

NANOOS participates in national IOOS DMAC activities. NANOOS DMAC Chair, User Products Chair, and Deputy Director often attend the monthly IOOS DMAC webinars, contributing agenda items, presentations, and facilitating breakout discussions at the IOOS Annual DMAC meeting. Where appropriate, data processing codes are and will be made publicly available via GitHub repositories so that our methods and tools can be readily shared for greater IOOS pan-regional and national collaboration. Lastly, NANOOS staff participate in national DMAC and Data Tools/Product working groups through IRA Topic 2.

Project 16: Serving as a Resource for PNW Data Providers

NANOOS will continue to help other regional observers build their data management capacity. We regularly consult on data architectures/servers, dataset structure, and quality control procedures, with an aim towards enabling easy ingestion of non-NANOOS funded regional assets into NVS for use by PNW communities. Additionally, NANOOS maintains a backend data harvesting system, BlueHarvest, that allows us to source data from nearly anywhere and store it in the NANOOS database for quick and easy access during the product development process (PI Tanner, UW-APL). BlueHarvest also ingests model forecast fields via THREDDS or other cloud services to produce mapped overlays of forecast variables in NVS.

4. Modeling and Analysis Subsystem

Objective 7. Provide sustained support to a community of complementary regional numerical models

NANOOS has historically supported three forecast models: LiveOcean in coastal WA, OR, BC, and the Salish Sea; OSU ROMS in coastal WA and OR; and Virtual Columbia River in the Columbia River estuary and shelf. Each regional-scale model supports specific stakeholder requirements, as detailed in the projects below. Output from these models is available on NVS with the ability for users to switch between models, as well as to use a built-in "comparator" to compare models with observing data in real-time. Through IRA, we enabled the development of a wave-current interaction model to better predict wave conditions at the mouth of the Columbia River. We propose to sustain this effort and transition it to operational status on NVS. We also serve model output from researchers not supported directly by NANOOS. This includes biogeochemical model output from Canada's Salish Sea Cast (Susan Allen, UBC), seasonal forecast J-SCOPE biogeochemical model (Samantha Siedlecki, U Conn), and SSCOFS (NOAA). In alignment with the NOS Modeling Implementation Plan, all of our forecast systems are built on community models, and we will explore consolidation of the Virtual Columbia River with SSCOFSv2 (both SCHISM), as described in Project 19. We anticipate consolidation efforts will enable new investment in BGC for SCCOFSv2 (Khangaokar, PNNL/UW), which could then be available for operations at NOAA.

Project 17: Coastal and estuarine biogeochemical forecasting: LiveOcean

LiveOcean is a ROMS-based computer model of 3-D ocean circulation and biogeochemistry for the coastal waters of OR, WA, Vancouver Island, and the Salish Sea (PI Hewett, UW-APL). The system has been making daily three-day forecasts since 2015 with output readily available to the public through NVS and the LiveOcean homepage. Based on user requirements from the shellfish industry, we now produce daily three-day forecasts using nested higher-resolution sub-models of Willapa Bay-Grays Harbor and South Puget Sound. LiveOcean has been continuously validated against observational datasets from many sources (WA Dept. of Ecology, NOAA, King County, NANOOS, OCNMS, OOI, Canadian scientists, among others), which makes it a trusted data source by diverse user groups for decision-making. Information is obtained from external data sources for atmospheric forcing (provided by UW Atmospheric Sciences), ocean conditions, and inputs from rivers and wastewater treatment plants. In addition to daily forecasting operations, we create and systematically update long hindcasts, which currently span over 13 years (2013 - present). Long hindcasts are essential for model validation and support a variety of science projects with separate funding [22, 23, 24]. We make these data available by completing custom model hindcast extractions at the request of stakeholders and by hosting processed hindcast data on the LiveOcean homepage for download. The model system has undergone continuous development since it went online, improving model performance compared to observations, and improving model reliability. All the code for the system is publicly available through GitHub.

Benefits: As the only model in the region offering daily biogeochemical forecasting, LiveOcean provides real benefits to many stakeholders including commercial, tribal, and recreational shellfish and crab fishers, public health managers, scientists, and students. It allows managers to ensure a safe harvest without unnecessary HAB closures [25, 26]. The aragonite saturation state forecasts are used by the oyster industry, especially in Willapa Bay. Bottom oxygen forecasts are used by the Dungeness Crab fishermen on the WA shelf. Model hindcast experiments are being developed for King County to help estimate the effects of the discharge of treated sewage on hypoxia in Puget Sound. Model forecast extractions are used by a company (Scoot Science) that supports the sustainable fisheries and aquaculture industries. Other model extractions are used as open boundary conditions for models developed by other researchers and companies working on projects in the Salish Sea, Hood Canal, and Sequim Bay.

Project 18: Data assimilative coastal currents and physical forecasting: OSU ROMS

The OSU coastal ocean forecast system, including its data assimilation component [27], has been in operation since 2011, providing information on surface currents, SST front locations and other oceanic variables of interest to NANOOS users (PI Zaron, OSU). An important product of the forecast system is

the Fishers web app, which is the most popular product in NVS. Our work aligns with the NOS Modeling Implementation Plan through model intercomparison and validation efforts. The OSU forecast system is ROMS-based, which a number of groups participate in developing and which has a large user-base. Our model forecast covers the appropriate geographic scale to meet user needs and to be nimble enough to rapidly develop research-based improvements in an operational system. Our efforts can especially inform improvements to frameworks for variational data assimilation. Additionally, the LiveOcean ROMS model and our OSU coastal ocean forecast system ROMS model are complimentary. We have used this (non-data-assimilating) modeling system as a benchmark against which our own data-assimilative forecast products can be compared. In addition, LiveOcean includes significant bio-geochemical modeling components which our system does not include.

Benefits: Countless fishers on the WA and OR coast rely on the NANOOS Fishers App powered by the OSU ROMS model. They have requested new features like pycnocline depth and temperature horizons for other species that we incorporated and will continue to support. New forecast products of surface currents and trajectories, and subsurface dissolved constituents will add value to existing observations by combining sparse observations with ocean forecasts to map subsurface properties.

Project 19: Virtual Columbia River

NANOOS will support CRITFC to continue to maintain a forecast system and a retrospective simulation sequence and climatological atlas for the Columbia River estuary and coastal ocean (PI Seaton, CRITFC). CRITFC will also continue to participate in collaborations to improve and consolidate regional forecasting, in alignment with the NOS Modeling Implementation Plan. CRITFC's Virtual Columbia River model and Dr. Tarang Khangaonkar's Salish Sea model both use the same underlying hydrodynamic model, SCHISM, and the two models include both regions within their domain. The Salish Sea model is currently funded by the COMT program, through NANOOS, as the research to operations (R2O) prototype of for the NOAA CO-OPS Salish Sea and Columbia River Operational Forecast System (SSCOFS), while the Virtual Columbia River model has recently been developed in parallel with the NOAA OCS Pacific 3-D Surge and Tides Operational Forecast System (STOFS-3D-Pacific). We will explore integration of the Virtual Columbia River model and the Salish Sea model to reduce redundancy and produce an improved single regional R2O forecast system, benefiting from local expertise in both the Columbia River and Puget Sound.

Benefits: Forecasts of the Columbia River estuary and plume are critical for maritime commerce and safety, e.g. navigation by commercial freight traffic, commercial fishers, and recreational boaters. Model results are currently being evaluated by NOAA fisheries biologists to improve regional fisheries models, and we will evaluate the use of forecasts to support NOAA fisheries forecasts. The forecasts are used by fishers to predict the position of the Columbia River plume.

Project 20: Waves & Currents at Mouth of the Columbia River (MCR)

We will advance the development and verification of an operational, high-resolution wave forecasting system that explicitly accounts for wave–current interaction at the MCR (PI Haller, OSU). With IRA funds, we have implemented an unstructured-grid WaveWatchIII (WW3) model that is unidirectionally coupled with the SCHISM circulation model. We propose to adapt our model to new regional SCHISM model grids, continue testing and verification, and deploy research-grade data products through NVS. In addition to standard testing of model skill against NDBC buoy data, we will add novel comparisons to satellite (SWOT) data and the newly installed current meter (CDIP 162). We will test various wave- current coupling approaches (i.e. depth-averaged, surface only, and depth-varying current profiles) for accuracy and computational efficiency. We will engage the Columbia River Bar Pilots and regional NWS forecast offices to co-design a suite of wave and current data products for visualization and interaction on NVS.

Benefits: The Columbia River is a critical economic corridor and one of the most hazardous major commercial waterways in the world. The Columbia River Bar Pilots and regional NWS forecast offices are

key end users who have expressed a clear need for improved coupled forecasts, forecasts that incorporate wave–current interaction, which are essential for safe bar transits, vessel routing, and operational decision-making. This project will provide higher-accuracy predictions of wave conditions at the MCR, enabling better hazard assessments and improving forecasting reliability, delivered via NVS, and refined based on regular engagement with pilots, forecasters, and regional maritime stakeholders.

4. Engagement (& User Product Development) Subsystem

Objective 8. Sustain and strengthen NANOOS engagement

NANOOS leverages its history of effective stakeholder engagement gaining user input on NANOOS' vision and products through sustained and meaningful interaction, much aligned with the NOAA Water Initiative's Model of Service Delivery. We propose to build from and strengthen our ongoing Engagement efforts. NANOOS Engagement Chair Wold (UW-APL) and NANOOS Deputy Director Carini (UW-APL) will lead Engagement activities with NANOOS Director Newton (UW-APL) and in concert with our Oregon Sea Grant colleagues (PI Nielsen) who are part of NANOOS' Engagement team. Wold will continue to work with the IOOS Association and the IOOS Program Office to support IOOS efforts on a national scale.

Project 21: Engagement

Our engagement efforts will continue to build awareness of NANOOS and provide opportunities for iterative communication. Communicating our impact is essential to increase the public's understanding of and support for NANOOS and IOOS and the benefits of an ocean observing system for our region and nation. We will create strategic communications via social media, the NANOOS newsletter, and monthly "Update" emails to engaged NANOOS users. We will continue to engage nationally with the IOOS Association and the other RAs to coordinate and amplify messaging, to ensure IOOS is known nationwide to a broad stakeholder base. We propose to maintain and grow our engagements to present and demonstrate NANOOS data tools and solicit feedback/requests through participation at existing events hosted by all sectors of the NANOOS community (e.g., boating/fishing expos, academic conferences, state/local coastal hazards workshops, tribal organization-sponsored events, etc.). NANOOS will also continue to schedule hands-on training and host webinars based on user needs and new product availability (e.g., how to access data through ERDDAP, how to use NVS for fishers, how to be prepared using the NANOOS Tsunami Evac App, etc.). Outreach and engagement efforts are the primary way NANOOS solicits and receives stakeholder requirements and feedback to guide the iterative refinement of existing data products and the development of new tools [3, 28]. These activities have proven effective for recruiting diverse user groups; we have over 20,000 registered NANOOS users, and many more who use our site without creating an account. A metric of success is that NANOOS previously requested most engagement opportunities, but now groups reach out to invite us to provide regular NVS training for their communities.

Project 22: Education

Increasing ocean literacy will be addressed through engaging with teachers at schools who can use NANOOS products in their curricula and promoting the lesson plans that were developed for NANOOS using our data and products. Examples include professional development sessions at South Whidbey schools, ocean acidification lesson development with the Technology Access Foundation, and NVS demonstrations for formal and informal teachers at the annual Northwest Aquatic and Marine Educators conference. We will continue to engage with schools like Maritime High School, WA, mentoring students about marine-related career paths. We will engage with interns in other programs as appropriate to foster the next generation of the ocean observing workforce, and encourage curriculum development from interns, engaged teachers, and others. NANOOS proposes to support a joint CRITFC- OSU internship program. CRITFC will coordinate a research-based summer internship for undergraduate tribal students, in collaboration with NANOOS PIs at OSU. Summer interns will participate in fieldwork and conduct mentored

research projects using CMOP and NANOOS datasets. Activities will include exposure to ocean observing technologies, data analysis, professional development, and tribal fisheries and resource management.

Objective 9. Continue to deliver existing and create innovative and transformative user-defined products and services for PNW users

Project 23: User Products and Co-development

The primary mission of the user-driven NANOOS is to provide PNW stakeholders with ocean data, tools, and information they need to make responsive and responsible decisions. We do this through our website, where we provide information resources, news, and related products, and through our NVS web and mobile apps. We use weekly NANOOS tag-up calls to bring user feedback directly to DMAC and User Products staff and facilitate timely responses to user questions and requests [28]. This "Tri-Committee" of Engagement, DMAC, and User Products, along with NANOOS leadership, evaluates the website and product suite annually to set and adjust priorities as appropriate.

The Engagement team will support the Web Development team's efforts in refining the NANOOS web portal to meet the needs of data users via such activities as gathering feedback from targeted users (e.g., focus groups, surveys, or informally at outreach events) and creating training resources within the NVS Help App, such as FAQs and tutorial videos. We will be responsive to regional and local events (e.g., harmful algal blooms, marine heat waves, hypoxia, floods, etc.) by highlighting "from-the-field" stories from NANOOS members and partners to enhance the public's understanding of these events and the relevance of NANOOS efforts to improve monitoring, prediction, and response to these events. Additionally, we will continue to host and further develop complementary products, like the J-SCOPE seasonal ocean forecast used by Dungeness crab managers and the HABs product pages with information, real-time monitoring, and forecasts for HABs. Keeping the NANOOS portal fresh, and using the NANOOS home page, social media platforms, and regular newsletters to bring traffic to the NANOOS portal, will help retain current NANOOS end users and entrain new ones. We will continue using Google Analytics as a mechanism for capturing and viewing visitor statistics for the NANOOS website and visualization products and investigate new ways to capture additional information to better learn how visitors are using our website and products.

NANOOS User Products Chair and lead web developer, PI Tanner, will continue to enrich the NANOOS web interface, NVS, user products, and visualization and data discovery tools. NVS incorporates observational data from a wide range of federal and local data providers and merges them into a common visualization framework. Our flexible framework has proven an effective and cost-efficient approach for making information quickly available, responding to events and stakeholder needs. We will continue adding data sources to meet community needs as they become available. Several transformational tools have been developed for NVS in the last couple years, and NANOOS will prioritize refinement of these tools. The "Share My View" tool allows users to create a unique link to share the exact region, platforms, layers, timing, etc. on their screen with others. Dynamic overlays provide users the ability to mouse-over a model overlay and see the exact value at that location and to customize colorbars and ranges to fit their needs. Finally, the Transect Tool, which has long been requested by our scientific, fishing, and search and rescue user groups, allows users to draw a transect anywhere on the map and see available multi-depth data along that transect or to drop a virtual mooring at a point and see a depth-profile of available variables.

The number of NANOOS users who primarily access the internet through mobile devices (phone or tablet) continues to increase. NVS, however, is a feature-rich web application that does not easily operate on mobile devices. To address usability on mobile devices, we have developed native mobile apps for the NVS Tsunami Evacuation app. We will continue to maintain and evolve these apps to add user-requested functionality. For other key NVS apps, we will develop mobile-friendly progressive web app (PWA) versions. The PWA version of NVS will allow us to tailor the mobile experience to specific communities, providing the capabilities they need the most in a fashion that is streamlined for mobile devices.

f) Milestone Schedule: This table provides high level NANOOS Core Milestones organized by Subsystem and Project. More detailed milestones for each project will be developed through the descope process.

NANOOS Core Milestones								
#	**Project**	**Milestone**	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**
GOVERNANCE & MANAGEMENT								
Objective 1. Maintain NANOOS as the U.S. IOOS PNW Regional Association								
		Annual meeting of Governing Council and Principal Investigators	X	X	X	X	X
		Bi-monthly meetings of Executive Committee	X	X	X	X	X
1	Governance Activities	Participate in U.S. IOOS and IOOS Association Meetings	X	X	X	X	X
	Program Management & Fiscal	Tri-Committee (Engagement, DMAC, User Products) weekly calls and annual meeting	X	X	X	X	X
2	Administration	Prepare and submit semi-annual Progress Reports and provide fiscal oversight	X	X	X	X	X
OBSERVING								
Objective 2. Maintain and enhance surface current and wave observations								
		Maintain OR and WA HFR sites to national standards	X	X	X	X	X
	Surface Current Mapping using High-	Assure data meets Certification standards; Deliver data to National HFR DAC; Deliver data products via NVS	X	X	X	X	X
3	Frequency Radar	Add HFR sites in the Strait of Juan de Fuca			X	X	X
	Waves at the Port of Newport using X-band	Maintain X-band radar site; Deliver data products via NVS	X	X	X	X	X
4	Marine Radar	Develop new data products			X	X	
	Backyard Buoys: Community-stewarded	Maintain existing partnerships to support 6 wave buoys; Engage new communities to deploy 10 new wave buoys	X	X	X	X	X
5	Coastal Wave Observations	Assure data meets Certification standards; Deliver data to BB ERDDAP, NDBC, GTS, & NCEI; Maintain data access via NVS & BB mobile app	X	X	X	X	X
Objective 3. Sustain and enhance buoys and gliders in the PNW coastal ocean, in coordination with national and regional programs								
		Sustain Cha'ba, NEMO, CB-06, and Columbia River plume moorings	X	X	X	X	X
6	Ecosystem Observations from Shelf Buoys	Assure data meets Certification standards; Deliver data to NANOOS ERDDAP, NDBC, GTS, and NCEI; Deliver data products via NVS	X	X	X	X	X
		Sustain La Push, WA Shelf, and Trinidad Head glider lines	X	X	X	X	X
		Assure data meets Certification standards; Deliver data to National Glider DAC and NCEI; Deliver data products via NVS	X	X	X	X	X
		Sustain new pH and nitrate capabilities on La Push and Trinidad Head glider lines				X	X
7	Ecosystem Observations from Shelf Gliders	Add PAM to WA Shelf glider line		X			
Objective 4. Maintain and expand multidisciplinary observational capabilities in PNW estuaries and the nearshore, in coordination with local and regional programs								
		Maintain ORCA moorings, CMOP stations, and SSNERR stations	X	X	X	X	X
		Complete transition of all ORCA moorings to buoy-driven float profiler	X	X			
		Establish/reoccupy locations of interest within the CR estuary	X		X		
		Evaluate biological monitoring technologies, such as environmental DNA, imaging systems, acoustics, or other tools		X			
	Ecosystem Observations from Estuarine	Update sensors and telemetry systems in SSNERR			X		
8	Moorings	Assure data meets Certification standards; Deliver data to NANOOS ERDDAP, NDBC, GTS, and NCEI; Deliver data products via NVS	X	X	X	X	X
	Ecosystem Observations from Estuarine	Maintain and enhance sampling from WSDOT ferry and Victoria Clipper	X	X	X	X	X
9	Ferry Boxes	Improve data transmission and cloud-based repositories; Deliver data products via NVS			X		
		Maintain all PNW HAB Bulletin components	X	X	X	X	X
	Harmful Algal Bloom (HAB) Observations:	Maintain SoundToxins support through WA Sea Grant	X	X	X	X	X
10	PNW Bulletin components & SoundToxins	Deliver PNW HAB Bulletin and related data products via NVS	X	X	X	X	X
Objective 5. Maintain and enhance core elements of beach and shoreline observing								
		Maintain and expand beach and shoreline surveys in WA and OR	X	X	X	X	X
11	Beach & Shoreline Monitoring	Deliver all data to NANOOS ERDDAP and NCEI; Deliver data products via NVS	X	X	X	X	X
		Maintain and expand nearshore bathymetry surveys in CRLC and OR	X	X	X	X	X
12	Nearshore Bathymetry Surveys	Deliver data to NANOOS ERDDAP & USGS ScienceBase; Develop data products for NVS	X	X	X	X	X
		Maintain 7 cameras at 5 sites along the WA and OR coast	X	X	X	X	X
13	WebCOOS	Integrate WebCOOS live video streams, beach change products and other products into NVS	X				
DMAC								
Objective 6. Maintain, harden, and enhance the NANOOS DMAC system for routine operational distribution of data and information								
		Maintain and improve NANOOS ERDDAP, following IOOS data and metadata standards; Send relevant data to NDBC & GTS	X	X	X	X	X
		Continue to implement and refine QARTOD on NANOOS-funded datasets	X	X	X	X	X
		Maintain existing and build new pathways for NCEI archiving	X	X	X	X	X
14	Maintaining Certified Data Provider Status	Complete any updates required for successful recertification		X	X		
	Participating in National IOOS DMAC	Participate in IOOS DMAC webinars, IOOS DMAC Annual Meeting, and relevant national DMAC working groups	X	X	X	X	X
15	Activities	Contribute to the IOOS GitHub repository, sharing NANOOS data processing codes and methods/tools of interest	X	X	X	X	X
	Serving as a Resource for PNW Data	Provide expert advice on DMAC topics to regional data providers not funded by NANOOS	X	X	X	X	X
16	Providers	Maintain and improve BlueHarvest to continue to be able to ingest observation and model data streams for NVS	X	X	X	X	X
MODELING & ANALYSIS								
Objective 7. Provide sustained support to a community of complementary regional numerical models								
		Sustain daily production of LiveOcean 3-day forecasts; Deliver data products via NVS	X	X	X	X	X
	Coastal and estuarine biogeochemical	Continue to improve LiveOcean accuracy and capabilities (e.g., down-scaling, particle tracking, etc.)		X		X	
17	forecasting: LiveOcean	Continue to use LiveOcean to answer region-specific research questions	X	X	X	X	X
	Data assimilative coastal currents and	Sustain daily production of OSU ROMS 3-day forecasts; Deliver data products via NVS	X	X	X	X	X
18	physical forecasting: OSU ROMS	Improve data assimilation methods for surface currents		X		X	
		Maintain a forecast for operations and a hindcast simulation for climatologies; Deliver data products via NVS	X	X	X	X	X
19	Virtual Columbia River	Explore consolidation with SSCOFSv2	X				
		Further test, verify, and refine the model		X			
		Transition from development to operations			X	X	
20	Waves & Currents at MCR	Co-design data products for NVS with stakeholder groups			X	X	X
ENGAGEMENT (& USER PRODUCT DEVELOPMENT)								
Objective 8. Sustain and strengthen NANOOS engagement								
		Sustain and strengthen NANOOS engagement efforts	X	X	X	X	X
		Sustain efforts for strategic regional and national communications	X	X	X	X	X
21	Engagement	Maintain open channels for user feedback at all stages of the NANOOS product development cycle	X	X	X	X	X
		Sustain and strengthen NANOOS education efforts	X	X	X	X	X
22	Education	Support CRITFC-OSU summer internship for tribal students	X	X	X	X	X
Objective 9. Continue to deliver existing and create innovative and transformative user-defined products and services for PNW users								
		Maintain and improve the NANOOS website based on user requirements	X	X	X	X	X
		Maintain and improve NVS based on user requirements	X	X	X	X	X
23	User Products and Co-development	Develop a mobile-friendly progressive web app for data visualization	X	X			

6. Data Management Plan

This document summarizes how NANOOS meets its requirements to make environmental data and information collected or created under NOAA grants or cooperative agreements discoverable by and accessible to the public, in a timely fashion, free of charge. The costs of data preparation, accessibility, or archiving are included in the proposal budget. For further details, see the NANOOS Data Management Plan (DMP) online at https://www.nanoos.org/documents/certification/DMP/2023/NANOOS-DMP.pdf

Environmental Data and Information Types: NANOOS DMAC integrates and manages data from a variety of sources and types of assets that include in-situ observations, remote sensing observations and products, processed data products (such as climatologies and anomalies), and numerical model nowcasts and forecasts, each from both "internal sources" (NANOOS-funded assets) and "external sources" (regional, federal, or international, non-NANOOS-funded assets). Variables handled encompass meteorology; physical, chemical, and biological oceanographic properties; and nearshore geomorphology. Both "internal" and "external" observational data streams may be grouped into four categories that share many characteristics: 1) surface currents and waves, 2) fixed-location sensor platforms, 3) mobile platforms, and 4) beach and shoreline observations. Additional data streams include remote sensing products derived from satellites and a suite of modeling efforts that characterize the regional ocean (waves, currents, water temperature, salinity, oxygen, pH etc.) and atmosphere (winds, air temperature, etc.).

Timeframe and Methods for Data Access: All data collected or generated by NANOOS and served via NVS, ERDDAP, or THREDDS will be made available within a maximum of 6 months from the date of collection. We report the following near real-time or lagged availability of data for observational data sources: 1) surface currents and waves: within 2 hours of the end of the recordings, 2) fixed-location sensor platforms: near-real time (<2hrs) or within 6 months of recovery, 3) mobile platforms: e.g., near-real time (<6hrs) for glider data and daily for ferrybox data, and 4) beach and shoreline observations: <2 months. The LiveOcean, OSU ROMS and CRITFC Columbia River numerical models are run daily. Nowcast and forecast fields are made available within one hour of the model run completing, via NVS and THREDDS servers currently hosted at OSU and CRITFC. Data access methods are summarized in the table below and detailed in the NANOOS DMP.

Standards for Data/Metadata Format and Content: NVS (http://nvs.nanoos.org) serves DAC functions as a central integrator and distributor of data, asset metadata, graphical products and related information available to users using common and consistent formats (Mayorga et al., 2010). The process for data ingestion into NVS includes base level quality control applied by the data collectors/PIs and the NANOOS DAC. Data volume ranges ~1 MB/day for most buoy/mooring observational platforms, 25 MB/day for each deployed glider, and 2 GB/day totaled for the 11 HF radar sites. NANOOS models generate about 10 GB of output per day. Where possible data and model output will be stored using CF compliant NetCDF files. The table summarizes quality assurance/quality control (QA/QC) protocols and standards for data and metadata. For details on data ingestion and management of data streams, see the NANOOS DMP.

Prior Experience: NANOOS was certified as a regional Data Assembly Center (DAC) in 2018 and recertified in 2023. NANOOS will sustain and enhance the DMAC system developed over the last decade, including the NVS for dynamic and distributed data access and visualization. NANOOS DMAC is managed and operated by a distributed but highly collaborative team: Travis (UW), Tanner (UW), and Carini (UW) with a collective four decades of DMAC experience. NANOOS will continue its regular strategic assessment of current and future needs for DAC operations, to sustain, refresh, and enhance a highly available, robust, distributed hardware and software environment; maintain appropriate staffing and team coordination; and maintain up-to-date operations and system documentation to ensure transparent and clear descriptions of DAC architecture.

Summary of Data/Metadata Standards and Access for the NANOOS Data Sharing Plan. For full descriptions, see the NANOOS Data Management Plan (DMP) online at https://www.nanoos.org/documents/certification/DMP/2023/NANOOS-DMP.pdf.

System	Operator	Asset Count	NVS Metadata	NVS Access*	NANOOS ERDDAP	NDBC WMO GTS	Archiving	DMP File
Surface Currents and Waves								
HF Radar (currents)	OSU	13#+	X	Plot		X	National DAC, NCEI	DMP HF Radar
Port X-band Radar (waves)	OSU	1#	X	All			PI	DMP Port X-band Radar
Buoys and Moorings								
WA Shelf Buoys	APL-UW	2	X	All	=	X	NCEI~	DMP WA Shelf Buoys
OR Shelf Buoy	OSU	1	X	All	X	X	NCEI~	DMP OR Shelf Buoy DMP OR Shelf Buoy OA Data
Puget Sound, ORCA Buoy Program	APL-UW	7	X	All	X	X	NCEI~	DMP Puget Sound ORCA Buoys
Columbia River estuary & plume CMOP network	CRITFC	9+	X	All	=	X	NCEI	DMP CMOP Network
South Slough Estuary	SSNERR	6+	X	All	==		NCEI	DMP NERR South Slough
Gliders and Ferries								
Trinidad Head Glider	OSU	1	X	Plot	=	X	National DAC, NCEI	DMP Trinidad Head Glider
WA Shelf Glider	OSU, CRITFC	1	X	Plot	=	X	National DAC, NCEI	DMP WA Shelf Glider
La Push Glider	APL-UW	1	X	Plot	=	X	National DAC, NCEI	DMP La Push Glider
Ferry-based Obs.	WDOE	1	X	All			State Agency	DMP Victoria Clipper Ferrybox
Beach and Shoreline Observations								
OR Beach & Shoreline	DOGAMI	N/A	X	Plot	X	N/A	State Agency, NCEI~	DMP OR Shoreline Obs
WA Beach & Shoreline	WDOE	N/A	X	Plot	==	N/A	State Agency, NCEI~	DMP WA Shoreline Obs
Nearshore Bathymetry	OSU	N/A	X	Plot (tbd)	==	N/A	PI, USGS	DMP Nearshore Bathymetry

Symbols Key: * For NVS Access, "All" represents both data download and graphic presentation, and "Plot" only includes graphic presentation; # Number of radar sites; = Already in another ERDDAP and will be linked to NANOOS ERDDAP in near future; == Will be added to NANOOS ERDDAP in near future; ~ NANOOS will work with NCEI and PI to get dataset archived using existing pathways as templates/ entry submitted to NCEI, but not yet processed due to long queue; + Several stations are currently inactive but may be redeployed as resources allow.

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8. Resumes

1. Jan Newton, UW
2. Roxanne Carini, UW

Listed alphabetically

3. Jonathan Allan, DOGAMI
4. Andrew Barnard, OSU
5. Jack Barth, OSU
6. Anna Bolm, OSU
7. Rosie Gradoville, CRITFC
8. Merrick Haller, OSU
9. Alicia Helms, ODSL
10. Kate Hewett, UW
11. George Kaminsky, WA Ecology
12. Maria Kavanaugh, OSU
13. Michael Kosro, OSU
14. Kate Litle, UW
15. John Mickett, UW
16. Calvin Mordy, UW
17. Karina Nielsen, OSU
18. Luc Rainville, UW
19. Peter Ruggiero, OSU
20. Charles Seaton, CRITFC
21. Troy Tanner, UW
22. Vera Trainer, UW
23. Seth Travis, UW
24. Edward Zaron, OSU

9. Letters of Support

Alphabetically listed

1. Canadian Integrated Ocean Observing System - Pacific Region
2. Columbia River Bar Pilots
3. Confederated Tribes of the Umatilla Indian Reservation
4. Emergency Volunteer Corps of Nehalem Bay
5. Lower Columbia Estuary Partnership
6. Makah Tribe
7. Marine Exchange of Puget Sound
8. Marine Resources Advisory Committee for Washington State
9. Maritime Blue
10. Merchants Exchange of Portland, Oregon
11. Nez Perce Tribe
12. NOAA Fisheries Northwest Fisheries Science Center
13. NOAA Olympic Coast National Marine Sanctuary
14. NOAA Pacific Marine Environmental Laboratory
15. Northwest Indian Fisheries Commission
16. Oregon Coastal Management Program
17. Oregon Dungeness Crab Commission
18. Oregon Parks and Recreation Department
19. Pacific Coast Shellfish Growers Association
20. Pacific Northwest Waterways Association
21. Puget Sound Partnership
22. Puget Sound Restoration Fund
23. Quileute Tribe
24. Quinault Indian Nation
25. Sea-Bird Scientific
26. Taylor Shellfish Farms
27. Washington Department of Fish and Wildlife
28. West Coast Ocean Data Portal
29. Western Washington University

CIOOS PACIFIC

REGIONAL ASSOCIATION OF THE
CANADIAN INTEGRATED OCEAN OBSERVING SYSTEM

4 March 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

I am writing to offer strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

The data and tools provided by NANOOS have come to be relied upon for partners across the region with two decades worth of data and ocean intelligence infrastructure from partners now built around the NANOOS system. For example, real-time tools like the OceanConnect App and NANOOS Shellfish Growers App have enabled users to rely upon access to critical data for their safety and their business operations decisions.

The Canadian Integrated Ocean Observing System (CIOOS) is an open-access national system that brings together the various elements of ocean observation in Canada. It facilitates access to existing resources, new information, and technology and makes data discoverable. Three Regional Associations work closely with local oceanographic communities and organizations to meet the end-user needs.

The CIOOS Pacific Region relies on critical resources provided by NANOOS. For example, our team is building a regional application focused on ocean acidification and hypoxia that integrates model and real-time ocean sensor data across the Salish Sea and Puget Sound region. Access to the data from NANOOS sensors will serve bilateral commerce and facilitate early warning systems around ocean conditions in support of the U.S. and Canadian Blue Economy.

NANOOS has been a valued partner not only from the data side, but also by serving in an advisory role for regional ocean observing. NANOOS Director, Jan Newton, serves on the CIOOS Pacific Advisory Panel and her team provides regular technical and regional scientific advice. In turn, CIOOS Pacific creates complementary transboundary tools that enable the Washington State region to leverage substantial financial and operational investments in ocean observing in Canada.
We look forward to maintaining and growing this collaboration into the future for the mutual benefit of both of our Nations and regions.

Sincerely,

Jordan Watson

Jordan Watson
Director, Canadian Integrated Ocean Observing System, Pacific Region

THE COLUMBIA RIVER BAR PILOTS

Providing Safe Passage Since 1846

20 March 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

We write this letter to offer strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled “Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS” by Dr. Jan Newton.

NANOOS has been a valued partner and regional coordinating body, providing unique and effective data for mariners. Ships crossing the Columbia River Bar face one of the most dangerous harbor entrances in the world. The Columbia River Bar Pilots rely on weather forecasts, real time buoy data along with wave and current models when determining safe times for ships to cross the Bar. NANOOS provides an excellent location for us to see and compare all the available data sources.

Further, NANOOS has proven itself as a critical link between NOAA management, PNW stakeholders and Universities creating wave, current and weather models.

I am pleased to let you know that NANOOS is making a very real difference to the safety and efficiency of maritime operations in the Columbia River area of the Pacific Northwest.

Best Regards

Captain Daniel Jordan

100 16th Street, Astoria, Oregon 97103
office: 503-325-0405 • dispatch: 503-325-2641 • email: adminpilots@columbiariverbarpilots.com
www.columbiariverbarpilots.com

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

700 NE Multnomah Street, Suite 1200
Portland, Oregon 97232

(503) 238-0667
www.critfc.org

January 22, 2026

Krisa Arzayus, IOOS Acting Director
NANOOS-IOOS Office
1315 East-West Highway, Station 2616
Silver Spring, MD 20910

Dear Dr. Arzayus,

On behalf of the Confederated Tribes of the Umatilla Indian Reservation (CTUIR), I wish to express our support for the University of Washington (UW)'s 2026-2030 Integrated Ocean Observing System (IOOS) Regional Association proposal, "Sustaining and Enhancing Northwest Association of Networked Ocean Observing Systems (NANOOS), the Pacific Northwest component of the U.S. IOOS." NANOOS-supported observations and predictions in the Columbia River estuary, as well as in the Oregon and Washington coastal ocean, are essential for monitoring conditions and improving understanding of the ocean and estuary ecosystems that support anadromous species such as salmon, steelhead, lamprey, and eulachon—species that return to the Columbia River and are culturally important food sources for the tribes.

The Columbia River Inter-Tribal Fish Commission's (CRITFC) tribal restoration plan, *Wy-Kan-Ush-Mi Wa-Kish-Wit* - Spirit of the Salmon, establishes the importance of gravel-to-gravel restoration, which ensures sufficient survival of fish at every life stage, including critical survival during passage through the estuary and growth to adulthood in the ocean. CRITFC plays an important role in supporting the scientific and technical capacity of the tribes to address these estuarine and ocean life stages through the work of the Coastal Margin Observation and Prediction (CMOP) estuary and ocean research program and by serving as a NANOOS Executive Committee member.

NANOOS's continued monitoring of ocean and estuary conditions, and its continued funding for CMOP, will help increase the technical capacity of each of the CRITFC member tribes to restore healthy and abundant salmon populations to the Columbia River Basin.

Sincerely,

Corinne Sams
CTUIR – CRITFC Secretary

EVCNB EMERGENCY VOLUNTEER CORPS OF NEHALEM BAY EVCNB.org

March 16, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

I am the president of the Emergency Volunteer Corps of Nehalem Bay, a not-for-profit organization dedicated to educating those who live in the area about how to be prepared should a disaster strike. This area, in northern Tillamook County on the Oregon Coast, is susceptible to significant weather events and when the Cascadia Earthquake and subsequent tsunami occur, will be isolated for several weeks, if not months.

I am writing to offer strong support for the continuation of NANOOS funding at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

We have partnered with DOGAMI's Dr. Jonathan Allen and his team for many years and their support and knowledge has been an integral part of our ability to provide credible and actionable information to our community. NANOOS has been a valued partner and regional coordinating body for this area. We have had several excellent presentations from Dr. Allen on the latest science impacting this coastal area, what we can do to be prepared and how this evidence-based information can be used to keep people safe during the worst of times. The information that NANOOS generates is a critical part of our being able to meet our mission – to promote a culture of preparedness.

NANOOS has been a critical part of our educational outreach. We have utilized their tsunami web-based and smart phone application to provide critical tools to those who live in this area to understand the safest places to be after an earthquake or other geologic hazard. Their work is integral to keeping our, and many other communities along the Oregon Coast updated with the latest information on issues related to climate change and coastal erosion. Without their work, we would not be able to be as prepared as possible.

Thank you for your consideration of their request.

Sincerely,

Patricia L. Johnson
President, Emergency Volunteer Corps of Nehalem Bay

Lower Columbia Estuary Partnership

March 4, 2026

Krisa Arzayus, IOOS Acting Director
NANOOS-IOOS Office
1315 East-West Highway, Station 2616
Silver Spring, MD 20910

Dear Ms. Arzayus:

The Lower Columbia Estuary Partnership (Estuary Partnership) supports the Northwest Association of Networked Ocean Observation Systems' (NANOOS) application "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS". The Estuary Partnership is a member of NANOOS and collaborates regularly with several of its members, including the Columbia River Inter-Tribal Fish Commission's (CRITFC) Coastal Margin Observation and Prediction (CMOP) Program. The CMOP assets are essential for understanding physical and biogeochemistry conditions at the mouth of the Columbia River and indeed represents the only systemic monitoring of these conditions in the lower Columbia River. These observations at the river mouth are where ocean conditions first influence the estuary and the early marine environment experienced by outmigrating Pacific salmon and steelhead. Funding for NANOOS and CMOP products support more effective conservation and restoration of coastal ecosystems and enable the sustained use of coastal resources, including shellfish and salmon and steelhead runs.

The Lower Columbia Estuary Partnership (Estuary Partnership) is one of 28 National Estuary Programs, administered by USEPA under Section 320 of the Clean Water Act. Our Comprehensive Conservation and Management Plan calls for monitoring the status and trends of ecosystem conditions in the lower Columbia River, and CRITFC's CMOP represents the only monitoring of instream habitat conditions for the mainstem Columbia River below Bonneville Dam. Located at the mouth of the Columbia River, CMOP stations uniquely capture ocean–estuary exchange.

It is difficult to exaggerate the importance of this program to resource managers and our ability to understand the extent, frequency, duration, and magnitude of hypoxia, ocean acidification, and saltwater intrusion from increasing sea levels into the mouth of the Columbia River. Unlike estuaries and coastal areas along the East Coast of the U.S., much of the West Coast is sadly deficient in monitoring resources, and NANOOS represents the vast majority of monitoring of biogeochemistry and physical conditions along the Pacific Northwest coast (and CMOP in the lower Columbia River). The proposal represents the realized result of the previous work by CRITFC and NANOOS to design and implement coastal and ocean observation systems within the lower Columbia River and along the coast of the Pacific Northwest. Continued investment would maintain existing and replace lost infrastructure, build new capacity, and ensure the resulting captured data are translated into publicly accessible products that support management and decision-making.

The Estuary Partnership looks forward to continuing our partnership with NANOOS and CRITFC on this and future projects. If you have any questions, please do not hesitate to contact myself or Catherine Corbett, our Chief Scientist (ccorbett@estuarypartnership.org).

Best Regards,

E. Elaine Pacido

E. Elaine Pacido
Executive Director
Lower Columbia Estuary Partnership
eplacido@estuarypartnership.org

MAKAH TRIBE

P.O. BOX 115 • NEAH BAY, WA 98357 • 360-645-2201

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

March 25th, 2026

Dear Dr. Krisa Arzayus,

I am writing as the Director of the Makah Tribe's Fisheries Management program to offer strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

The Makah Tribe is a federally recognized tribal government located on the Northwestern corner of the Olympic Peninsula in Washington State. The Makah Fisheries Management department is the agency responsible for the management and monitoring of the Tribe's natural resources; both maritime and terrestrial. The Makah Tribe has been reliant on the ocean for food sovereignty, cultural wellbeing, community resilience, and economic security since time immemorial. This inextricable relationship continues today, in part through the Tribe's robust and valuable treaty fisheries. Recent community surveys have shown that our treaty fisheries support over 50% of the Tribe's annual economy, with that figure being much higher during active fisheries. Critically, the Makah Tribe's exercise of treaty reserved fishing rights is place based and limited to the boundaries of its federally adjudicated Usual and Accustomed Fishing Area (U&A), which covers 1,550 square miles of marine territory. The place-based nature of these rights means that, should changes to ocean conditions disrupt fishing within the Makah U&A, Makah fishermen cannot simply move elsewhere as non-tribal fishermen can. This means that it is imperative for the Makah Tribe to clearly understand our local and regional marine environment, how that environment fluctuates on an annual basis, and how it is changing over time. NANOOS, in our opinion, functions as a lynchpin in efforts to better understand our changing ocean.

NANOOS is a valued partner and regional coordinating body in the monitoring and exploration of the marine environment in our area. They excel at bringing together Federal, Tribal, and State managers; as well as academic institutions, scientists, and various marine-focused user-groups. NANOOS aggregates, collates, and distributes this collection of knowledge in a comprehensive, cohesive, and nuanced picture of the ocean; one that can be engaged with and understood by any of the contributors and interested user groups. In the case of the Makah Tribe, we heavily rely on NANOOS for active tracking and forecasting of marine heatwaves, hypoxic events, harmful algal blooms, and tidal currents. We consider it imperative that NANOOS continue to function at it currently does, will all the funding and support that entails.

Sincerely,

Russell Svec
Fisheries Director – Makah Tribe

March 5, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Arzayus:

I write on behalf of the Marine Exchange of Puget Sound (MXPS) to offer our strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled “Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS” by Dr. Jan Newton.

MXPS is a member-supported maritime industry association founded in 1980, providing 24/7 vessel tracking, real-time data, advocacy, and operational support to the Pacific Northwest maritime community. Through our AIS network, we monitor over 7,000 vessel movements annually across the Salish Sea, while also representing the industry at the local, state, and federal levels and supporting a wide range of maritime organizations throughout the region.

NANOOS is an essential resource for MXPS and broader Pacific Northwest maritime community. The real-time oceanographic data and coastal hazard information that NANOOS provides directly supports our mission and the day-to-day safety of maritime operations in our region. Our operations center, which is staffed around the clock, relies on timely, accurate data to assist mariners and members with operational decision-making, particularly in a region where dynamic ocean conditions, complex tidal systems, and rapidly changing weather patterns can pose significant challenges to vessel safety.

The Pacific Northwest maritime community is deeply interconnected with the health of our regional waters, and the decisions we make daily depend on the quality of the data available to us. NANOOS represents a critical piece of that data infrastructure, and has demonstrated over two decades of service, its commitment to operational reliability and scientific excellence for users. We strongly urge NOAA to fund the continuation and enhancement of NANOOS for the 2026–2031 cycle in support of safe and sustainable maritime operations.

Sincerely,

Patrick Gallagher, Executive Director
Marine Exchange of Puget Sound
patrick@marexps.com

MARINE RESOURCES ADVISORY COUNCIL

March 11, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Betsy Peabody, Chair, Marine Resources Advisory Council

Dear Dr. Krisa Arzayus:

I am writing with enthusiastic support for the continuation of NANOOS for its next five years, as proposed in the submission to NOAA "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOSS" by Dr. Jan Newton.

I chair the Marine Resources Advisory Council for Washington State, responsible for coordinating efforts to address the threat of ocean acidification. NANOOS is one of the tools that Washington State has invested in to better understand ocean acidification and enable adaptation by shellfish growers and managers. This is a critical tool for our region as we continue to work to understand our changing oceans.

NANOOS has been a valued partner and regional coordinating body, and its products and data are widely used in the region. Thank you for this opportunity to express my strong interest in seeing NANOOS supported for the future. We are all so fortunate to have such deep collaboration in our region as we try to solve this growing threat to our culture, economy, and marine environment.

Sincerely,

B Peabody

Betsy Peabody, MRAC Chair

A Strategic Alliance for Maritime Innovation and a Sustainable Blue Economy

March 16, 2026
Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

Maritime Blue is a strategic alliance dedicated to accelerating innovation in the Blue Economy, based in Washington State. As a member of the NANOOS Executive Council, I write to offer our strongest support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

As an ocean cluster organization, Maritime Blue provides a convening space for government, industry, community, research and investors. Our members value the services NANOOS provides. NANOOS provides high-quality, freely accessible ocean data that support maritime operations and fisheries. These sectors are pillars of the Washington State economy. NANOOS' data also accelerates innovation and entrepreneurship for ocean-based climate solutions and resilience.

NANOOS has been a valued partner and regional coordinating body. The NANOOS team and researchers provide thoughtful leadership that breaks through organizational silos to connect ocean observing projects. This connective tissue allows NANOOS to vastly expand the impact of public funding by allowing ocean observing projects to reach many more end users.

Thank you for your full and fair consideration of the NANOOS proposal, and we offer our highest level of support for the proposal.

Sincerely,

Joshua Berger
President and CEO
Washington Maritime Blue

MERCHANTS EXCHANGE

March 27, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

On behalf of the Merchants Exchange of Portland, Oregon, I am writing to offer our strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

The Merchants Exchange is a non-profit maritime information hub serving the Columbia River and Pacific Northwest region. We provide critical services to the maritime community, including vessel tracking, communications, safety coordination, and real-time information that supports efficient and secure port operations. Our members include shipping agents, vessel operators, port authorities, and other stakeholders who rely on accurate, timely environmental and operational data.

NANOOS has been a valued partner and regional coordinating body whose data products and observational systems directly support maritime safety, planning, and decision-making. The availability of real-time oceanographic and meteorological data enhances accurate information to vessels transiting the Columbia River Bar and navigating complex coastal conditions. These insights contribute to safer vessel movements, reduced risk, and improved operational efficiency across our port system.

In particular, NANOOS's commitment to integrating and disseminating high-quality data through accessible platforms has been instrumental for our operations. The regional coordination they provide ensures consistency and reliability in the information shared by pilots, ship operators, and emergency responders. This capability is essential in a region where environmental conditions can change rapidly and have significant operational implications.

Continued investment in NANOOS will strengthen the resilience and safety of the Pacific Northwest maritime transportation system. We strongly support the continued funding and enhancement of NANOOS and appreciate the opportunity to express our endorsement.

Sincerely,

Curtis Cannizzaro

Curtis Cannizzaro
Executive Director
Merchants Exchange of Portland

200 SW Market Street, Suite 190, Portland, Oregon 97201 | p. 503-228-4361 | f. 503-295-3660 | www.pdxmex.com
24-Hour Marine Operations Services | Association Management Services | Vessel and Cargo Statistics

COLUMBIA RIVER INTER-TRIBAL FISH COMMISSION

700 NE Multnomah Street, Suite 1200
Portland, Oregon 97232

(503) 238-0667
www.critfc.org

January 22, 2026

Krisa Arzayus, IOOS Acting Director
NANOOS-IOOS Office
1315 East-West Highway, Station 2616
Silver Spring, MD 20910

Dear Dr. Arzayus,

On behalf of the Nez Perce Tribe, I wish to express our support for the University of Washington (UW)'s 2026-2030 Integrated Ocean Observing System (IOOS) Regional Association proposal, "Sustaining and Enhancing Northwest Association of Networked Ocean Observing Systems (NANOOS), the Pacific Northwest component of the U.S. IOOS." NANOOS-supported observations and predictions in the Columbia River estuary, as well as in the Oregon and Washington coastal ocean, are essential for monitoring conditions and improving understanding of the ocean and estuary ecosystems that support anadromous species such as salmon, steelhead, lamprey, and eulachon—species that return to the Columbia River and are culturally important food sources for the tribes.

The Columbia River Inter-Tribal Fish Commission's (CRITFC) tribal restoration plan, *Wy-Kan-Ush-Mi Wa-Kish-Wit* - Spirit of the Salmon, establishes the importance of gravel-to-gravel restoration, which ensures sufficient survival of fish at every life stage, including critical survival during passage through the estuary and growth to adulthood in the ocean. CRITFC plays an important role in supporting the scientific and technical capacity of the tribes to address these estuarine and ocean life stages through the work of the Coastal Margin Observation and Prediction (CMOP) estuary and ocean research program and by serving as a NANOOS Executive Committee member.

NANOOS's continued monitoring of ocean and estuary conditions, and its continued funding for CMOP, will help increase the technical capacity of each of the CRITFC member tribes to restore healthy and abundant salmon populations to the Columbia River Basin.

Sincerely,

Ashton Picard
Nez Perce – CRITFC Chair

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NOAA Fisheries
Northwest Fisheries Science Center
Conservation Biology Division
2725 Montlake Blvd East
Seattle WA 98112-2097

23 March 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

On behalf of the NOAA Fisheries Northwest Fisheries Science Center, the NOAA California Current Integrated Ecosystem Assessment (CCIEA) team, and the U.S. West Coast Changing Ecosystems and Fisheries Initiative (CEFI), I write to offer strong and enthusiastic support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

The NOAA CCIEA and CEFI teams are composed of scientists and policy makers representing the Northwest and Southwest Fisheries Science Centers, the NOAA Fisheries West Coast Regional Office, and many academic and NGO partners. These teams strive to provide science in support of ecosystem-based management of fisheries, protected species, and other valuable resources and ecosystem services along the U.S. West Coast. We rely heavily upon primary data collection platforms such as those in IOOS to provide monitoring data and expert understanding, in order for us to generate products such as ecosystem status reports, stock assessments, risk assessments, and management strategy evaluations. Among our strongest partners are the Pacific Fishery Management Council; the Pacific Whiting Treaty; the five National Marine Sanctuaries located along the West Coast; state fisheries management agencies; and the NOAA Fisheries Office of Protected Resources.

Information collected by NANOOS is ideal for the work we do, and is already being incorporated into our efforts, including annual ecosystem status reporting to the Pacific Fishery Management Council. For example, NANOOS provides a product that forecasts short term (six to nine month) ocean conditions that were requested by the Pacific Fishery Management Council. In addition, NANOOS provides the CCIEA and CEFI teams with information about real-time ocean conditions. We process and relay this information to our management partners, a pipeline that is squarely aligned with the Executive Order on Restoring American Seafood Competitiveness. As a specific example, NANOOS hosts a real-time harmful algal bloom (HAB) website to provide near real-time information on HABs on the Washington coast. The data are generated by *in situ* instrumentation operated by NWFSC and CCIEA team scientists, and the

NANOOS platform allows distribution of this information to coastal managers to inform fisheries management decisions. In addition, the NANOOS data are a key component of the regional assets needed by the West Coast CEFI team to evaluate and improve a new generation of ocean models developed and maintained in perpetuity by NOAA's Geophysical Fluid Dynamics Laboratory.

In the next five years, we strongly endorse plans for NANOOS to sustain and enhance buoys and gliders in the PNW coastal ocean, in coordination with national and regional programs; maintain and expand multidisciplinary observational capabilities in PNW estuaries and the nearshore, in coordination with local and regional programs; provide sustained support to a community of complementary regional numerical models; and, maintain, harden, and enhance NANOOS' Data Management and Cyberinfrastructure (DMAC) system for routine operational distribution of data and information. These objectives support the NWFSC, CCIEA team, and CEFI team by providing observing infrastructure and continuity of data streams that enable real-time observations and forecasting of ocean conditions, and access to information.

Sustained funding for NANOOS is crucial to the maintenance of the ocean observing network and to continue the delivery of important data products and services that these observing systems enable. Continuity of data streams, data processing and delivery, and monitoring focused on emerging priorities are only becoming more essential as other monitoring efforts are curtailed due to funding and logistical constraints. The CCIEA and CEFI teams and our many partners thus strongly endorse support and funding of NANOOS projects. Please feel free to contact me if you have any questions.

Sincerely,

Jameal F. Samhouri, Ph.D.
Ecosystem Science Program Manager
Supervisory Research Fish Biologist
Co-lead, California Current Integrated Ecosystem Assessment team
Co-lead, West Coast Changing Ecosystems and Fisheries Initiative

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF NATIONAL MARINE SANCTUARIES
Olympic Coast National Marine Sanctuary
115 East Railroad Avenue, Suite 301
Port Angeles, WA 98362-2925

March 9 th, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Arzayus:

As Superintendent of Olympic Coast National Marine Sanctuary (OCNMS), I enthusiastically endorse the submission to NOAA entitled *Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS,* by Dr. Jan Newton. The Nortwest Association of Networked Ocean Observing Systems (NANOOS) provides valuable data and services, many of which greatly enhance our understanding of ocean ecosystem dynamics influencing conditions within OCNMS.

The mission of NOAA's Office of National Marine Sanctuaries is to protect treasured places in the ocean and inspire momentum for a healthy ocean. Designated in 1994, OCNMS spans 3,188 square miles of marine waters off the rugged Olympic Peninsula coast in Washington State. Since 2000, OCNMS has deployed an array of oceanographic moorings along approximately 135 miles of the Olympic Coast, between May and October, to document water column conditions during the upwelling season. This long-term oceanographic monitoring enhances the understanding and resilience of the sanctuary to changing ocean conditions. This is vital information needed by resource managers to support the numerous ecosystem services the Olympic Coast provides to the Coastal Treaty Tribes, commercial and recreational fisheries, as well as the millions of annual visitors to the Washington coast.

NANOOS has been a valued partner and regional coordinating body for observing systems, providing an integrated depiciton of ocean conditions in the Pacific Northwest (PNW). OCNMS, and many of our partners, are excited about NANOOS strengthening existing infrastructure and capacity. For example, for the first time, OCNMS is deploying two real-time oceanographic bouys this year. The data from these will be integrated into the NANOOS Visualization System, making the data immediately available to a regional audience. NANOOS is the the ‘one-stop shop’ for observational and model data, forecasts and decision-making tools in the PNW. NANOOS has continually demonstrated dedication to effectively and collaboratively serving the community of resource managers and users in our.

I fully endorse this proposal. I strongly believe that *Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS* is critical to ensuring reliability in multidisciplinary observational capabilities in the PNW, which will enable us to better identify,

respond to, and potentially mitigate, growing environmental stressors. To continue this invaluable service, I strongly recommend that NANOOS be funded at a high level for its next five year proposal.

Please feel free to contact me by email with any further questions at kevin.grant@noaa.gov .

Sincerely,

Kevin Grant
Sanctuary Superintendent
Olympic Coast National Marine Sanctuary

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Oceanic and Atmospheric Research
Pacific Marine Environmental Laboratory

NOAA/PMEL Building Number 3
7600 Sand Point Way NE
Seattle, WA 98115

March 16th, 2026

MEMORANDUM FOR: Krisa Arzayus, IOOS Acting Director
FROM: Michelle McClure

IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

As the laboratory leading NOAA's West Coast coastal ocean acidification (COA) monitoring program, I am writing to express our strong support for the proposal of Dr. Jan Newton and colleagues entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS." NOAA was mandated by Congress to lead the nation's COA monitoring and research effort. NOAA's OA monitoring network in Pacific Northwest coastal waters, detailed in the NOAA Ocean, Coastal, and Great Lakes Acidification Research Plan: 2020–2029, was designed to capitalize on existing NANOOS assets, which provide essential platforms and extremely valuable ancillary sensors that facilitate and complement NOAA's COA observations. Without NANOOS assets, our ability to effectively monitor the development and effects of COA in Pacific Northwest coastal waters would be significantly curtailed.

The Pacific Northwest is a sentinel region for COA nationwide, because waters upwelled along our coastline are naturally CO_2-rich, such that the addition of anthropogenic CO_2 makes them corrosive to marine organisms sooner than in other regions. We collaborate extensively with NANOOS on deployment of observing assets to monitor OA status, trends, and extreme events; development of COA indicators to serve managers and other end users; and education and outreach. NANOOS has been a valued partner and regional coordinating body in numerous partnerships with Tribal and state fisheries and water quality managers, providing the platform to bring them actionable information about ocean conditions from modeling and observing projects PMEL leads or contributes to. PMEL scientists use models and observations from NANOOS in support of their research and work closely with NANOOS and the Washington

Ocean Acidification Center (WOAC) to provide COA data and visualizations from Salish Sea cruises to other researchers and interest holders through the NANOOS platform, supporting numerous biological or modeling studies in the region. Finally, with accelerating marine carbon dioxide removal (mCDR) activity and field trials, the many years of observed and modeled COA information provided by NANOOS serves as a foundation to this newer field of ocean carbon research by providing background information about COA conditions in the region prior to experimental manipulations. These are just a few examples of the reach and impact of NANOOS's work in the COA world, they also provide timely, safety-relevant information to end users about fishing, boating, and beach conditions; tsunami evacuation zones; and other maritime operations.

In sum, we cannot overstate the importance of maintaining NANOOS infrastructure, data management, and outreach capacities to sustain and enhance the successful outcomes of NOAA's West Coast and national COA monitoring networks and information products.

MCCLURE.MICHELLE.MARIE.1365819889

Digitally signed by MCCLURE.MICHELLE.MARIE.1365819889
Date: 2026.03.17 08:38:25 -07'00'

Michelle McClure
NOAA / PMEL Director

Northwest Indian Fisheries Commission
6730 Martin Way E., Olympia, Washington 98516-5540
Phone (360) 438-1180 www.nwifc.org FAX # 753-8659

March 23, 2026

Krisa Arzayus, Acting Director
IOOS Program Office
National Oceanic Atmospheric Administration
1315 East-West Highway
Silver Spring, MD 20910

Re: NWIFC Support for the Continuation of NANOOS

Dear Dr. Arzayus:

I write to offer strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

The Northwest Indian Fisheries Commission (NWIFC) is a natural resources management support service organization for 20 treaty Indian tribes in western Washington.[1] The NWIFC was created following the 1974 U.S. v. Washington ruling (Boldt Decision) that re-affirmed the tribes' treaty-reserved fishing rights, recognizing the tribes as natural resources co-managers with the State of Washington. The role of the NWIFC is to assist member tribes in their role as natural resources co-managers by providing direct services to tribes in areas such as biometrics, fish health and salmon management to achieve an economy of scale. The NWIFC also provides a forum for tribes to address shared natural resources management issues and enables the tribes to speak with a unified voice, promoting responsible resource management and conservation to safeguard natural resources for future generations.

NANOOS has been a valued partner and regional coordinating body. NANOOS plays an important role in supporting marine monitoring in Indigenous and coastal communities, while also integrating and visualizing disparate data sources to make ocean data more accessible, including for groups heavily impacted by ocean conditions such as fishers, boaters, and shellfish growers. Integrated datasets and forecasts on harmful algal blooms, hypoxia, ocean acidification, and other marine stressors serve as critical early warning systems for coastal communities, including coastal tribes that are most impacted by changing coastal and marine conditions. In this way, NANOOS helps support both real-time planning for tribal fisheries, as

[1] The NWIFC member tribes are the Hoh, Jamestown S'Klallam, Lower Elwha Klallam, Lummi, Makah, Muckleshoot, Nisqually, Nooksack, Port Gamble S'Klallam, Puyallup, Quileute, Quinault, Sauk-Suiattle, Skokomish, Squaxin Island, Stillaguamish, Suquamish, Swinomish, Tulalip, and Upper Skagit.

well as long-term planning in response to threats like marine heatwaves, climate instability and changing ocean conditions.

Through partnerships and collaborations, NANOOS has also expanded the range of monitoring products available. For example, NANOOS has played a leadership role in initiatives such as Backyard Buoys, which enable Indigenous and coastal communities to collect and use wave data. This is particularly valuable along coastal Washington, where oceanographic sensor coverage remains limited.

Broadly, NANOOS has been incredibly valuable in spurring collaboration between agencies and communities including tribes, scientists, fishers, teachers, local government planners, and coastal managers. This enables more effective communication, planning, and resource use for coastal conservation and fisheries management.

Cumulatively, NANOOS plays an important role in bringing together different communities that rely on marine natural resources, as well as institutions and agencies that collect and analyze oceanographic and marine monitoring data. NANOOS has also helped expand marine monitoring data in coastal communities and made this data accessible by integrating and visualizing different data sources in an intuitive platform. Together, these contributions help both coastal tribes and other coastal communities who rely on marine resources to prepare and respond to changes in marine conditions.

Sincerely,

Ed Johnstone
Chairman

cc: Jan Newton, NANOOS Executive Director, Senior Principal Oceanographer, Applied Physics Laboratory, University of Washington

Oregon
Tina Kotek, Governor

Department of Land Conservation and Development
Oregon Coastal Management Program
635 Capitol Street NE, Suite 150
Salem, Oregon 97301-2540
Phone: 503-373-0050
Fax: 503-378-5518
www.oregon.gov/LCD

March 27, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

I write to offer strong support for the continuation of NANOOS at a high level of funding for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

NANOOS is a partner with the Oregon Coastal Management Program (OCMP), within the Oregon Department of Land Conservation and Development. The OCMP is a networked program that includes 10 other state agencies and 41 coastal counties and cities. NANOOS provides a valuable and essential service in bringing real-time and historic oceanographic data to a broad suite of stakeholders for emergency response, decision-making, and planning.

As a science-based decision support program, NANOOS collaborates with local, state, and federal agencies, tribes, resource managers, industry, policy makers, educators, scientists and the general public to provide data, models and products that advance our understanding of the current and future state of our coastal and global ocean. NANOOS focuses on high-priority regional requirements to provide the information necessary to address marine operations, coastal hazards, climate variability and change, and ecosystems, fisheries, and water quality.

Sustained funding for NANOOS is crucial to the maintenance of the Northwest's ocean observing network and to continue the delivery of important data products and services that these observing systems enable. Please feel free to contact me if you have any questions.

Sincerely,

Lisa Phipps

Lisa Phipps, Manager of the Oregon Coastal Management Program

OREGON
Dungeness Crab
COMMISSION

03-10-2026

Dr. Krisa Arzayus, Acting Director
Integrated Ocean Observing System (IOOS) Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr., Arzayus:

I am writing to offer strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

The Oregon Dungeness Crab Commission represents Oregon's commercial Dungeness crab fleet and works to promote, protect, and enhance this cornerstone fishery and the coastal communities that depend on it. Our industry is highly sensitive to changing ocean conditions, including temperature, salinity, hypoxia, and harmful algal blooms, and we rely on timely, trusted ocean information to fish safely and sustainably.

NANOOS has been a valued partner and regional coordinating body for our fleet, providing user-friendly access to critical observing data and forecasts through tools such as the NANOOS Visualization System. The crab fleet uses NANOOS products, including salinity information for bays and estuaries, to understand when conditions are suitable for bringing live crab into port and holding them in tanks. These tools support decisions about when it is safe and effective to pump bay water into live wells, avoid low-salinity events that can stress or kill crab, and time fishing and delivery schedules to maintain product quality. NANOOS has also engaged directly with fishermen and industry groups to tailor products to our needs, strengthening trust in the data and encouraging broader use on the water and on the dock.

Continued and enhanced support for NANOOS will directly benefit Dungeness crab fisheries by improving the availability, resolution, and usability of ocean and estuarine information that underpins our operations. As ocean conditions become more variable and extreme, having a stable, well-funded regional observing system is essential for safety, economic resilience, and effective management. We strongly encourage NOAA to fully fund the proposed NANOOS program for the coming five-year period so that this critical observation capacity can be sustained and further developed for the Pacific Northwest working waterfronts.

Sincerely,

Crystal Adams
Executive Director
Oregon Dungeness Crab Commission
Phone: 541-267-5810

Oregon
Tina Kotek, Governor

Parks and Recreation Department
725 Summer St. NE, Suite C
Salem, OR 97301-1271
(503) 986-0980
Fax (503) 986-0794
stateparks.oregon.gov

March 11th, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Re: Support for NANOOS research proposal

Dear Dr. Krisa Arzayus,

Please consider this letter as our department's support for the continuation of the Northwest Association for Networked Ocean Observing Systems (NANOOS) research project entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS."

The Oregon Parks and Recreation Department (OPRD) has a strong management role on the Oregon coast, as primary managers of Oregon's Ocean Shore State Recreation Area and over 70 coastal state parks. Our management responsibility includes 362 miles of ocean fronting shoreline between the Columbia River and the California Border. Our department is charged with permitting improvements and structures on the ocean shore such as shoreline protective structures. The research derived from this project may assist us as we make decisions regarding future development areas, management of our coastal park properties, and ocean shore responsibilities. The research proposed, particularly the enhancement of beach monitoring efforts in Oregon, appears to be of great benefit as we continue to review permit requests and the need for shoreline protection in the face of climate change and other long-term oceanographic trends.

Thank you for developing this research proposal. We look forward to the resulting information which will undoubtedly be of great assistance to our department as we strive to provide and protect outstanding natural, scenic, cultural, historic and recreation sites for the enjoyment and education of present and future generations.

Laurel Hillmann, our Ocean Shore Resource Coordinator, is available for any questions at (503) 857-9000 or can be contacted by email at laurel.hillmann@oprd.oregon.gov.

Sincerely,

Andrea Hanson
Andrea Hanson (Mar 13, 2026 11:20:37 PDT)

Andrea Hanson
Central Operations Resource Manager

March 16, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

PCSGA
PACIFIC COAST SHELLFISH GROWERS ASSOCIATION

Dear Dr. Krisa Arzayus:

On behalf of the Pacific Coast Shellfish Growers Association (PCSGA), I am pleased to offer strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled *"Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS"* by Dr. Jan Newton.

PCSGA was founded in 1930 and represents approximately 100 private and tribal shellfish farms across Alaska, California, Hawaii, Oregon, and Washington. Our members produce oysters, clams, mussels, and geoduck for domestic and export markets while supporting thousands of jobs in coastal communities. Shellfish farming has long been an essential part of the Pacific Northwest's working waterfronts and coastal economies.

NANOOS has been a valued regional partner to the shellfish industry and a critical source of environmental intelligence for growers throughout the Pacific Northwest. Shellfish farmers increasingly rely on ocean observing data and forecast tools to make operational decisions, from managing hatcheries to determining when to seed beaches or harvest product. Access to timely, accurate information about tides, currents, temperature, salinity, and harmful algal bloom risk allows growers to operate more efficiently while protecting both farm productivity and public health.

The work of NANOOS has also been instrumental in advancing understanding of ocean acidification and other changing ocean conditions affecting shellfish production. Through collaborations with state and federal agencies, academic researchers, and industry partners, NANOOS has helped translate complex oceanographic data into practical tools that growers can use in their daily operations. These resources, data, and forecasts have become an integral part of how many growers monitor environmental conditions and plan their work.

Continued support for NANOOS is essential to maintaining the ocean observing infrastructure and data services that coastal industries and communities depend on. Reliable long-term observations and forecasting tools strengthen the resilience of the

region's maritime economy and support informed decision-making across multiple sectors.

PCSGA strongly supports sustained investment in NANOOS and appreciates the program's continued partnership with the shellfish industry. The services and information provided through NANOOS make a meaningful difference for growers and coastal communities throughout the Pacific Northwest.

Thank you for your consideration and for your continued leadership in advancing the U.S. Integrated Ocean Observing System.

Sincerely,

Justin Stang
Policy Analyst
Pacific Coast Shellfish Growers Association
120 State Ave NE #142
Olympia, WA 98501

February 27, 2026

Krisa Arzayus, IOOS Acting Director
NANOOS-IOOS Office
1315 East-West Highway, Station 2616
Silver Spring, MD 20910

Re: Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS

Dear Ms. Arzayus,

On behalf of the Pacific Northwest Waterways Association (PNWA), I write in support of the University of Washington's proposal for Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS. The project intends to improve predictions of ocean and weather conditions and their effects on coastal communities and the nation in addition to improving the safety and efficiency of maritime operations.

PNWA has over 150 members, including ports, barge companies, steamship operators, grain elevator operators, agricultural producers, electric utilities, irrigation districts, and union labor throughout Washington, Oregon, and Idaho. Our association supports projects to advance and protect the region's navigation infrastructure, freight mobility, economic health, and the environment. We support the region's multi-modal transportation system, which provides safe, efficient, and reliable links to competitive domestic and world markets. Having accurate ocean and weather conditions and predictions are paramount to safe navigation and the Northwest Association of Networked Ocean Observing Systems (NANOOS) provides critical data to meet this need.

Under this proposal, the NANOOS program work will support development of ocean condition forecasts, including the NOAA Center for Operational Oceanographic Products and Services (COOPS) Salish Sea and Columbia River Operational Forecast (SSCOFS) developed at the Puget Sound Institute and the NOAA NOS Surge and Tide Operational Forecast 3D Pacific (STOFS-3D-Pacific) developed at CRITFC Columbia River Inter-Tribal Fish Commission (CRITFC).

The proposal will also develop wave-current models for the Columbia River bar which is one of the most dangerous places to navigate in the world. This wave-current model work is currently being developed in a collaboration between Oregon State University (OSU) and CRITFC. The proposal will support meteorological and ocean condition operations in the Coastal Ocean and Columbia River estuary that are used for weather forecasts. In 2023, over 51.1 million metric tons of foreign and domestic water borne trade valued at over $25.3 billion transited the Columbia River System. PNWA's members, including the Columbia River Bar Pilots and Columbia River Pilots, rely on tools and information to increase navigation safety, particularly at the Columbia River bar. PNWA is pleased the proposal also includes an active outreach and engagement program for regional communities and interests.

PNWA supports NANOOS and appreciates your full and fair consideration of the University of Washington's proposal to improve the system to ensure better predictions for coastal communities and improve safe navigation operations.

Respectfully submitted,

Neil Maunu
Executive Director
Pacific Northwest Waterways Association

PUGETSOUND PARTNERSHIP

March 27, 2026

Dr. Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

SUBJECT: Letter of support for NANOOS

Dear Dr. Krisa Arzayus,

We write to offer strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

The Puget Sound Partnership (Partnership) is a state agency dedicated to protecting and restoring the Puget Sound and are a part of the Puget Sound National Estuary Program. We collectively work with governments, organizations, businesses, and individuals engaged in regional ecosystem recovery. The Puget Sound Ecosystem Monitoring Program (PSEMP) is one of many programs that the Partnership supports to generate, organize, synthesize, and communicate scientific information across political and organizational boundaries. Together, we track ecosystem conditions that directly address management and science questions through the data and information shared across monitoring organizations, including NANOOS. NANOOS's mission and priority aligns with the Partnership's Action Agenda around research and monitoring priorities broadly and is a critical partner to our PSEMP network.

NANOOS has been a valued partner and regional coordinating body that has actively engaged and been a leader in marine monitoring. They are leaders as data aggregators and host a critical data visualization platform. NANOOS supports the networked data management that PSEMP partners, other scientists, and Puget Sound management agencies rely on to carry out their work. Their data aggregator and visualization products ensure scientists and management have timely access to a variety of data including marine water quality from buoys, weather conditions, zooplankton, and phytoplankton. This data improves our best available science for ocean factors and conditions, data, and data accessibility. All of which have implications to our region's economy including our fisheries and aquaculture, recreational usage, and communities.

Thank you for your consideration.

Sincerely,

Mindy Roberts

Mindy Roberts
Executive Director

PUGET SOUND
RESTORATION FUND

8001 NE Day Road W, Suite B
Bainbridge Island, WA 98110

3918 15th Place West
Seattle, WA 98119

(206) 780-6947
www.restorationfund.org

March 26, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

This letter represents Puget Sound Restoration Fund's (PSRF) strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

Since 1997, PSRF has worked to incubate and deploy restoration solutions for Puget Sound's marine habitats and species, to sustain people and place. We focus on restoring foundational elements of the marine ecosystem that are also points of connection to people, with a focus on native species, including bull kelp, Olympia oysters, and pinto abalone. We test and refine our restoration methods based on research that we conduct with collaborators in the field and at the conservation hatchery that we operate at NOAA's Manchester Research Station. We are also pleased to have contributed to Washington State's Blue Ribbon Panel on Ocean Acidification's reports and to have co-authored the Puget Sound Kelp Conservation and Recovery Plan. Also relevant, we led a 5-year study, with Blue Dot Sea Farms, Washington Sea Grant and the University of Washington, to investigate sugar kelp cultivation as a strategy for mitigating ocean acidification, through improved seawater conditions or by providing shelter for sensitive species.

NANOOS has been a valued partner for PSRF and many others throughout the region, as well as a model for other ocean observing systems beyond this region. The NANOOS team works deliberately to connect data streams and make them relevant to a bevy or wide-ranging research, restoration, recreational, and industry uses. In doing so, NANOOS facilitates smart, timely use of a variety of data.

PSRF encourages your continued support of this critically important program.

Sincerely,

Jodie Toft
Executive Director

Quileute Natural Resources
· QUILEUTE INDIAN TRIBE ·
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March 19, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

This letter is to express dedicated support for the request to continue and maintain the extraordinarily successful and regionally critical Northwest Association of Networked Ocean Observing Systems (NANOOS). This program continues to be effective due to the efforts of a large collaborative community including Tribal, Federal, State Marine Resource Managers, academic institutions, and a variety of stakeholders. The IOOS funded NANOOS has been providing information that Quileute tribe utilizes in our marine management decision processes for more than 2 decades.

Quileute Tribal Council write to offer strong support for the continuation of NANOOS at a highest level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

Through our Department of Natural Resources, we are responsible for the management and conservation of a wide variety of treaty marine resources within the Quileute Tribes Usual and Accustomed Fishing Areas (U&A). The Quileute U&A encompasses over two thousand square miles of ocean including more than forty-five miles of shoreline.

We conduct in coordination with Federal marine resource managers, Washington State, and our neighboring tribes an extensive monitoring program of ocean conditions: inclusive of hypoxia, ocean acidification, ocean currents, phytoplankton and biotoxin production. It is important to note that within the Tribe's management, healthy marine resources are considered the most valuable treaty resources commercially, culturally and are the framework of community well-being.

Since 2005 when Quileute Indian Tribe joined NANOOS we have been fortunate to collaborate on several significant projects and consider NANOOS RA as a valued partner as a regional coordinating body. Real-time data accessibility provided through the NANOOS NVS HUB provides information and products that inform our management decisions such as harvest seasons, ocean users safety, and as an early warning system whether it be threats from a tsunami or biotoxin production. The beauty of this system is that its products are relevant at multiple scales and are user defined.

The continued investment to sustain and enhance this system of data collection, product development and community alignment serves to build coastal and community resiliency in the Pacific Northwest.

Sincerely,

Frank Geyer, Director

Quinault Indian Nation
PO Box 189 * Taholah, WA 98587

March 23, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

The Quinault Indian Nation welcomes this opportunity to reiterate our continuing support to maintain funding for the NANOOS regional association at a high level for its next five years, as proposed in the submission to NOAA entitled “Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS” by Dr. Jan Newton.

The Quinault Indian Nation is a treaty tribe located on the coast of Washington State with treaty rights extending into a large Pacific Ocean area of over 1500 square nautical miles. Our tribal members exercise their treaty rights to harvest fish and shellfish throughout that area, depending on it for our culture, subsistence and economic support. Our fleet of over 30 ocean-going vessels fish the open ocean, and our members harvest on the shorelines throughout the year, often in marginal weather conditions. We cannot stress enough the importance of our relationship with the NANOOS association, and its tools, used daily by our scientists, managers, fishers and tribal members. Ecosystem monitoring, forecasts of conditions, current conditions, fish availability, and surface water movements are just a few of the NANOOS tools and apps we use to protect our people’s safety and better manage our treaty resources.

Our membership in NANOOS began almost two decades ago and during that time the Quinault Nation, through NANOOS, has developed relationships with experts in marine science that have expanded our abilities to monitor and manage our ocean area. Importantly, our tribal students have also benefited by in-person visits from these experts to explain their scientific projects while motivating them to know more about our ocean.

We live in a very isolated area and visits like these go far to expand the horizons of our youth.

We thank you again for this opportunity to express our support for a strong NANOOS into the future. The importance of this organization to the Quinault Nation and its people cannot be overstated.

Sincerely,

Joe Schumacker

Ervin 'Joe' Schumacker
Marine Resources Scientist
Quinault Department of Fisheries
Quinault Indian Nation

Sea-Bird Scientific
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March 11, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Arzayus:

I write to offer strong support for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled *"Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS"* by Dr. Jan Newton.

Based in Bellevue, Washington, Sea-Bird Scientific is the world's largest supplier of in situ scientific instruments used to measure core oceanographic parameters such as temperature, salinity, pressure, dissolved oxygen, chlorophyll fluorescence, pH, nutrients, and optical backscattering. Our instruments are deployed globally on research vessels, moorings, autonomous vehicles, profiling floats, and coastal observing systems. The resulting measurements underpin research, operational oceanography, environmental monitoring, and maritime safety applications around the world.

As a business with headquarters in the Pacific Northwest, NANOOS has long been a valued regional partner and coordinating body for ocean observing activities. From the perspective of those of us who work regularly on the water in this region, the services provided by NANOOS are both practical and essential. These services are used routinely by scientists, technicians, mariners, and coastal managers across Washington and Oregon, improving both operational efficiency and safety at sea.

Equally important to Sea-Bird Scientific is the role NANOOS plays as a collaborative partner in advancing ocean observing technology. The Pacific Northwest is a uniquely challenging coastal environment, and NANOOS provides an exceptional testbed for new instrumentation and measurement approaches. Through deployments on regional moorings, gliders, and other platforms, NANOOS scientists and engineers have helped evaluate emerging sensors, provided thoughtful technical feedback, and contributed operational experience that informs our product development and engineering work. This type of real-world collaboration is invaluable for improving reliability, data quality, and usability of the instruments used throughout the oceanographic community.

NANOOS is also a valued customer of Sea-Bird Scientific instrumentation, and their deployments contribute directly to the sustained, high-quality observing systems that the IOOS enterprise was designed to support. Their commitment to rigorous measurements and open data access exemplifies the principles of IOOS and demonstrates the value of regional observing systems to both scientific and operational users.

In short, NANOOS plays a critical role in supporting safe and effective work on the water in the Pacific Northwest while simultaneously advancing the capabilities of the broader ocean observing community. Continued, stable support for NANOOS will ensure that this important regional infrastructure—and the partnerships it enables—remain strong.
Thank you for your consideration.

Sincerely,

Rob Ellison
Vice President of Research & Development
Sea-Bird Scientific

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March 13, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus:

I am pleased to write to share the strong support of Taylor Shellfish Farms for the continuation of NANOOS at a high level for its next five years, as proposed in the submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" by Dr. Jan Newton.

Based in Shelton, Washington, Taylor Shellfish Farms is a major producer of farmed oysters, clams and mussels in Washington State on 14,000 acres of tidelands that we own or lease and employing over 600 people in our hatcheries, nurseries, processing facilities, restaurants and on our farms.

To successfully farm the animals we do, we need to understand ocean chemistry and sea water parameters in and around our hatcheries, nurseries and farms. NANOOS has been a valued partner and regional coordinating body. They provide critical data for our operations and make it conveniently available through the NVS website with a page specifically for shellfish growers (https://nvs.nanoos.org/ShellfishGrowers).

As our company and industry have grappled with production issues related to ocean acidification NANOOS has been a tremendous asset. We strongly urge support for Dr. Newton's proposal.

Sincerely.

Bill Dewey
Director of Public Affairs
(M) 360-790-2330
Email: billd@taylorshellfish.com

State of Washington
Department of Fish and Wildlife

48 Devonshire Road, Montesano, Washington 98563-9618 (360) 249-4628

March 6, 2026

Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr. Krisa Arzayus,

This letter is to express the Washington Department of Fish & Wildlife's (WDFW) support for the proposal "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of U.S. IOOS" which requests a continuation of funding for the Northwest Association of Networked Ocean Observing Systems (NANOOS).

The Washington Department of Fish and Wildlife (WDFW) is responsible for the sustainable management of coastal shellfish resources, including Dungeness crab and razor clams, which are economically and culturally vital to our state. The coastal Dungeness crab fishery is Washington's most valuable commercial fishery, generating an ex-vessel value of $66.8 million in 2024, while razor clams support our largest recreational fishery with an estimated economic impact of $51.9 million. The sustainable management of both fisheries, as well as a variety of other fisheries along the coast and in Puget Sound, dependent on accurate environmental data.

NANOOS has been a valued partner and regional coordinating body that directly supports WDFW's mission to provide sustainable recreational and commercial opportunities while protecting our ecosystems. Our agency relies on the data and modeling products provided by NANOOS to navigate the chronic disruptions facing our coast. Specifically, we utilize the NANOOS Visualization System (NVS) and high-resolution forecasting tools like J-SCOPE to identify critical ocean acidification (OA) thresholds and hypoxia. These tools allow WDFW to optimize harvest timing and minimize economic disruptions caused by population declines or environmental stressors.

Furthermore, NANOOS plays a critical role in our ability to manage the impacts of harmful algal blooms (HABs). Blooms of *Pseudo-nitzschia* produce domoic acid, a biotoxin that regularly results in fishery closures that reduce tourism and threaten the economic viability of Washington's coastal communities. The sustained observations and enhanced modeling proposed by NANOOS are essential for our proactive management and for strengthening our tribal co-management relationships by ensuring research outputs are accessible and useful to Washington's Coastal Treaty Tribes.

State of Washington

Department of Fish and Wildlife

48 Devonshire Road, Montesano, Washington 98563-9618 (360) 249-4628

WDFW strongly endorses this proposal and encourages its funding and advancement. We are confident that the research team has the expertise, the partnerships, and the regional grounding necessary to carry this work forward successfully. Should you have any questions regarding WDFW's role or our collaborative history with NANOOS, please do not hesitate to contact me.

Sincerely,

Matthew George, Ph.D.
Coastal Shellfish Manager
Washington Department of Fish & Wildlife
Region 6, Montesano Field Office
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Matthew.George@dfw.wa.gov

WEST COAST OCEAN
DATA PORTAL

March 31, 2026

To: Dr. Jan Newton
Executive Director
NANOOS
1013 N.E. 40th Street
Seattle, WA 98105-6698

Dear Dr. Newton,

Subject: Letter of Support for the NANOOS Response to NOAA- FY'26 NOFO

On behalf of the West Coast Ocean Data Portal, I am writing to express our enthusiastic support for the 5-year budget proposal submitted by the Northwest Association of Networked Ocean Observing Systems (NANOOS) in response to the FY 2026 NOAA Notice of Funding Opportunity. Our organization has long relied on the high-quality oceanographic data and regional expertise provided by NANOOS to support our work in regional data coordination, sharing, and assessment focused on the priority topics of the West Coast Ocean Alliance (WCOA).

The value of NANOOS as a regional IOOS association lies in its unique ability to bridge the gap between national data standards and local stakeholder needs. Through its partnership NANOOS facilitates a cohesive network that connects disparate data streams—from autonomous gliders and buoys to satellite observations—into a single, accessible framework. The West Coast Ocean Data Portal (WCODP) seeks to increase access to and discovery of critical ocean and coastal data for resource managers and policymakers on the West Coast. The ocean observing information provided by NANOOS are important resources for us to highlight in our data catalog, so that our users (namely the state, tribal and federal agencies represented in the WCOA) can access the most up-to-date data and models to inform their decision-making at local and regional levels. This collaboration is essential for addressing transboundary challenges such as ocean acidification, hypoxia, and harmful algal blooms that affect the entire California Current Ecosystem. Additionally, as the WCODP works on several upcoming data-derived products, the expertise of those at NANOOS has been invaluable, and we expect to continue this working relationship and utilize data from the observing systems they support and maintain well into the future.

WEST COAST OCEAN
DATA PORTAL

Specifically, we value the following contributions:

- Regional Connectivity: NANOOS provides a vital link between state agencies, tribes, and academic researchers, ensuring that ocean observing assets are strategically deployed to fill critical information gaps.
- Actionable Data Products: Tools like the NANOOS Visualization System (NVS) translate complex scientific data into user-friendly products that our team highlights for WCOA members use.
- Informed Decision-Making: By integrating regional data into the WCODP, NANOOS ensures that our local observations contribute to a broader West Coast perspective enhancing the accuracy of models and forecasts that we depend on for coastal safety and economic stability.

The sustained funding of NANOOS is critical to maintaining these essential services. We look forward to continuing our partnership and leveraging the expanded capabilities this funding will provide to ensure a resilient and productive blue economy for the Pacific Northwest.

Sincerely,

Andy Lanier

Co-Chair, West Coast Ocean Data Portal

Stephen B. Weisberg, Ph.D.

Co-Chair, West Coast Ocean Data Portal

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March 27, 2026
Krisa Arzayus, IOOS Acting Director
IOOS Program Office
1315 East-West Highway
Silver Spring, MD 20910

Dear Dr Arzayus:

I write to express my strong support for continuation of NANOOS at a high level for its next five years, as proposed in Dr. Jan Newton's submission to NOAA entitled "Sustaining and Enhancing NANOOS, the Pacific Northwest Component of US IOOS" As a professor at Western Washington University, the top masters-granting and primarily-undergraduate-focused Comprehensive State University in the region, I use the NANOOS network frequently. I use it in the classroom, for graduate student research projects, and for my own research. I describe a sample of these uses below, and I hope these demonstrate some of the important educational and societal benefits that will continue with long-term strong investment in IOOS and NANOOS.

I teach an undergraduate course, 'ESCI 491, Oceanography of the Salish Sea,' where we use NANOOS data regularly using the NVS data explorer. We use ORCA buoys for examining differences between surface and subsurface conditions – including nutrients and oxygen - and doing time series analysis. I center a series of lessons around the LiveOcean model. Students use the model to examine patterns of salinity, oxygen, and transport at various scales. We use it to estimate and compare to our bulk predications of residence times, and for discussions of contaminant transport in various Puget Sound locations.

My graduate student Austin Valenti used NANOOS data extensively for his thesis entitled '*Assessing the effects of atmospheric heat waves on the exchange between Hood Canal and Admiralty Inlet*.' Austin's thesis required analyzing many years of data and he pulled together time series from USGS river gauges, SeaTac airport, two NANOOS ORCA mooorings, and the NANOOS LiveOcean mooring. His thesis could not have been done without NANOOS!

Lastly, an example of peer-reviewed research: I joined chemistry colleagues and was able use the NANOOS Se Lhaem Bellingham Bay buoy to analyze the likely relative contribution of ocean versus river sources of dissolved organic matter, and demonstrate the importance of high-frequency oceanographic time series compared to episodic, dock-based samples for assessing such dynamics. Jansen, C, McPhee-Shaw, E. Loughren, J, Jefferson Crosland, J, Yamamaura, A, Harrison, A, Aquila, F, de Bruyn, W, Clark, C, 2026, Assessing riverine inputs versus in situ production as sources of chromophoric dissolved organic matter in Bellingham Bayi n the Salish Sea. *Aquatic Sciences*.
https://doi.org/10.1007/s00027-025-01264-1

Sincerely,

E Shaw

Erika McPhee-Shaw,
Professor. Ocean Physics