

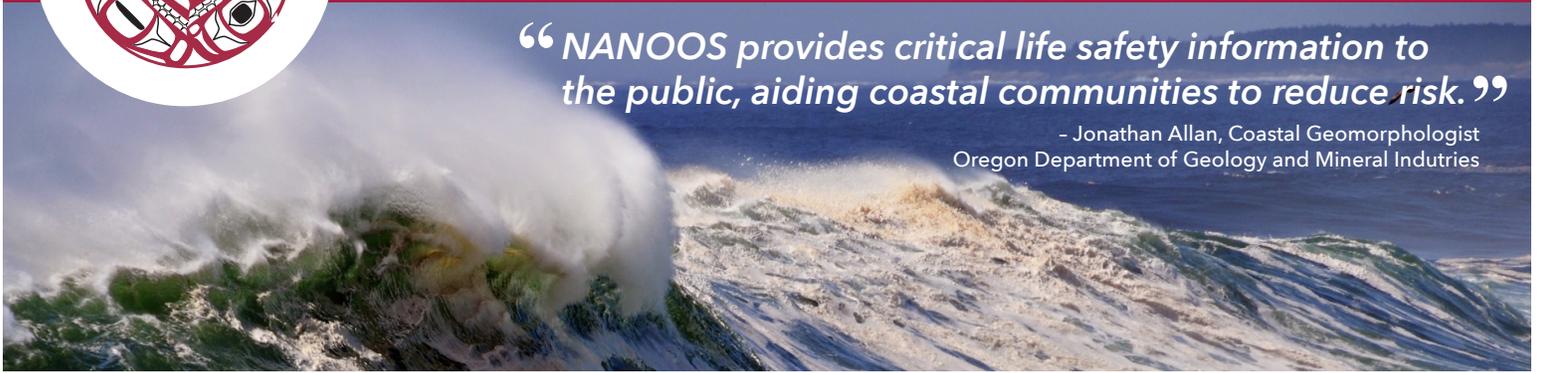


NORTHWEST ASSOCIATION OF NETWORKED OCEAN OBSERVING SYSTEMS (NANOOS)

The eye on the Pacific Northwest's ocean and coast

“NANOOS provides critical life safety information to the public, aiding coastal communities to reduce risk.”

- Jonathan Allan, Coastal Geomorphologist
Oregon Department of Geology and Mineral Industries



NANOOS is the Regional Association of the national Integrated Ocean Observing System (IOOS) in the Pacific Northwest, primarily Washington and Oregon. Investments in NANOOS have resulted in high-technology jobs, better-informed decisions, and ocean science innovations.

We help improve:

HEALTH

Decision making to protect human health

SAFETY

Enabling preparedness and security

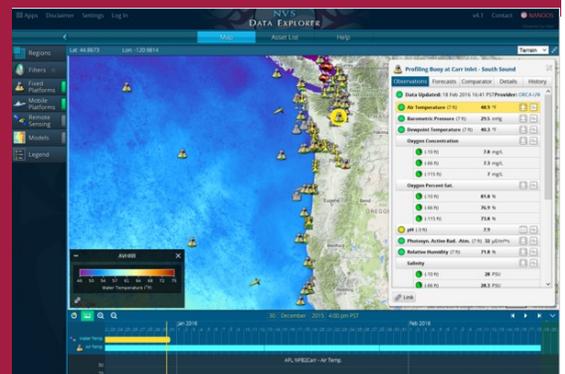
ECONOMY

Preserving economic benefits of the ocean



NANOOS Increases Efficiency

The NANOOS Visualization System (NVS) integrates data from many sources and makes all available in one online data portal, saving time and money. Real-time observations and forecasts from assets including buoys, shore and tidal stations, high-frequency radar, wave and current forecasts, and satellites are available in user-friendly data displays. NVS provides sophisticated yet accessible capabilities – comparisons of forecasts with real-time observations, and customized presentations based on community feedback.



nanoos.org
IOOS in the Pacific Northwest



Benefits for People and Businesses in the Pacific Northwest

Innovative Technology for Safe & Profitable Resource Use



NANOOS detects toxins from harmful algal blooms (HABs) from an undersea robot at La Push.

"Having the NANOOS automated HAB sampler, with toxin assessment capability, offshore between our harvest beaches and the HAB generation sites will give tribes the forewarning they need to adjust sampling protocols and better protect the health of coastal residents, tribal and non-tribal."

- Joe Schumacker, Department of Fisheries, Quinalt Indian Nation

NANOOS partners with industry to develop a lower cost sensor for effective shellfish growing.

"This current generation of shellfish farmer is reliant upon data and services from NANOOS. Checking the NANOOS app before seeding a beach or filling a settling tank has become standard practice."

- Margaret Pilaro, Director, Pacific Coast Shellfish Growers Association

Support for Maritime Operations, Safety & Fishing Commerce

"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."

- Captain Dan Jordan, Columbia River Bar Pilots

"NANOOS addresses a critical gap in recreational boater safety. Too many safety incidents on Pacific Northwest waters happen to pleasure boaters who make poorly informed decisions about if, when, how, and where weather may impact their safety. Sadly, many don't know how to access marine weather information freely available to them. NANOOS provides easy access weather information and routing tools to support better decision making by recreational boaters. I'm confident it will help save lives."

- Captain Margaret Pommert, National Association of Safe Boating Law Administration



Information for Coastal Hazard Risk Reduction



NANOOS data are used by the Oregon Department of Geology and Mineral Industries (DOGAMI) for coastal flood hazard maps; together NANOOS and DOGAMI provide tsunami hazard evacuation information to coastal populations. Both products aid risk reduction and increase coastal preparedness.

"Coastal erosion is a major threat to Pacific County. Dept of Ecology's coastal monitoring program supported by NANOOS has helped us solve many of our immediate erosion and flooding threats, adding greater resilience to our whole system and making our community much better prepared for long range threats such as climate change and sea level rise."

- David Cottrell, Commission Chairman, Pacific County Drainage District No. 1

"The Oregon Office of Emergency Management (OEM) appreciates the tools that NANOOS provides. The online tsunami evacuation route viewer is especially useful in helping coastal residents and visitors understand and respond to the tsunami hazards."

- Althea Rizzo, Coordinator, Oregon OEM Geologic Hazards Program



nanoos.org

For More Information

Contact us if you have any questions, or to learn more about our program:

Jan Newton, NANOOS Executive Director

206-543-9152 | janewton@uw.edu

Enhancing health, safety & economic prosperity in the Pacific Northwest

Fisheries Science and Commerce

"I start my work day every day by visiting the NVS data explorer for the latest real time data and modelling forecasts. NANOOS and the NVS data explorer have become a routine resource and are an incredible benefit to the management and mitigation of harmful algal blooms along Washington's outer coast for ORHAB. One stop shopping to open-access mooring data, satellite imagery, and UW's LiveOcean model have been instrumental in advancing ORHAB's understanding of ocean processes and harmful algal bloom development along Washington's outer coast."

– Anthony Odell, Research Analyst Lead, Olympic Region Harmful Algal Bloom (ORHAB) Monitoring Partnership — University of Washington/Olympic Natural Resources Center

"The NANOOS Visualization System is an essential tool for the shellfish industry and provides critical real time data to aid in decisions surrounding harvests, food safety and hatchery operations. Having immediate access to this information throughout the summer allows us to ensure the highest degree of confidence that our forecasting and harvest schedules are in accordance with the best practices and state vibrio control plans. As an industry, we'd greatly benefit from an expansion of the program and increase in monitoring sites to help us utilize this technology for safe and profitable resource use."

– Justin Stang, Wholesale Manager, Hama Hama Company

"I just wanted to let everyone know that the real time data from the various buoys are incredibly helpful for those of us in the Marine Fish Science Unit at WDFW. We use this information to assist us with planning our field sampling on a daily and weekly basis; wind speeds and directions, as well as temperatures, help us determine the feasibility of our sampling routine. We hope this network stays funded to provide long-term data that we can use to help understand the dynamics of forage fish and their trophic interactions in the southern Salish Sea and beyond!"

– Todd Sandell, Senior Forage Fish Specialist, Washington Department of Fish and Wildlife

"Your team has made this a very solid and valuable tool for our tuna fishing business. Some of my favorite features are trip planning and creating routes; identifying sea surface temperatures -- current and forecasted; combining chlorophyll locations with warm water currents; understanding current flow so I can estimate the direction and distance we will drift at night; and wave and wind forecasting. This application is helping us enjoy safer trips, find the fish easier and save on fuel usage. Thank you for the great job you're doing, we appreciate it very much."

– Gary and Julie Palmer, Fishing Oregon Podcast

"As an ocean sport fisherman, I want to give a huge shout out to the team at NANOOS. The NVS Tuna Fisher application has given me and other sport boats the ability to narrow our search area for the fish we seek. As a sport halibut fisherman, wave height, wind and current direction are very important in how far we travel offshore as well as set up for fishing. Your tools provide us the ability to glimpse hours out into the day before I leave the dock to ensure I have the best knowledge possible on where to go, but more importantly, whether or not to go. As a new albacore fisherman, I read the information provided on your site discussing chlorophyll and what it meant for tuna. I was then able to use your chlorophyll and sea surface temperature maps to target an area I thought may be productive. The education I have received from your tools has paid off greatly, saving us time and money. Lower fuel consumption is good for all of us. We love your toolset. Keep up the great work."

– Wallace Coon, F/V Kimberlie Marie, Oregon Resident

"The Swinomish Indian Tribal Community is concerned about the impacts climate change is expected to have on our shellfish resources. As a coastal tribe shellfish provide an important economic resource for our people and are culturally significant, having been used for ceremonial purposes and subsistence harvest since time immemorial. NANOOS is one of the tools that tribes are interested in learning from, and can help improve our understanding of ocean acidification and enable adaptation by shellfish growers and co-managers."

– Lorraine Loomis, Fisheries Manager, Swinomish Indian Tribal Community



Coastal Hazard Risk Reduction

"As a coastal community deeply committed to emergency preparedness, we find the new tsunami application to be a critical tool. It is easy and flexible to use and allows access to and clear designation of evacuation zones, allowing you to understand your risk and how to get to safety quickly after an earthquake. Access to accurate information is so important to our citizens and, as a destination location, to our visitors as well. We are proud to market our region as the most prepared on the Oregon coast and the tsunami software has become an important and useful tool!"

– Linda Kozlowski, President, Emergency Volunteer Corp of Nehalem Bay

"NANOOS is an invaluable partner and asset to the State of Oregon. The beach and shoreline monitoring data supports evidence-based efforts to maintain resilient and healthy communities through comprehensive coastal hazard mapping, understanding dynamic coastal systems, and sound planning practices."

– Lisa Phipps, Coastal Program Manager, Oregon Department of Land Conservation and Development

Recreation Safety

"For Pacific Northwest boaters crossing the Strait of Juan de Fuca or the Strait of Georgia, real time data on wave heights, wind speeds, and other meteorological information can be invaluable. To time such passages optimally and safely requires a knowledge of the sea conditions actually present at the time of the decision to set sail. A VHF weather broadcast, which is hours old can be inadequate when compared to the immediacy of the data available through the NANOOS NVS system."

– Captain Lincoln Rutter, S/V Sajal

"The NANOOS surfer application provides the most comprehensive assemblage of ocean and coastal data on water quality, swell direction/height, winds, tides, and beach cameras that is currently available for the Pacific Northwest. Having access to these current conditions and forecasting models is crucial for decision making on where and when to recreate, which aids in trip planning and safe ocean enjoyment."

– Gus Gates, Washington Policy Manager, Surfrider Foundation

Education

"The NANOOS apps provide direct and easy access to data about Puget Sound and the Washington Coast, allowing students to develop a better understanding of the world they live in. Students used the Shellfish Growers App to learn about the oceanic conditions in which shellfish live and how climate change might impact the organisms and the people who depend on them for food. The site was easy to navigate and use, even for first time users and supported students in asking their own questions and looking for answers."

– Rosalind Echols, Seattle Maritime High School

"Students in the Native Environmental Sciences program were introduced to the NVS/NANOOS platform as part of a lesson that included learning how to access datasets online for a GIS/Remote Sensing course. Students were introduced to the NANOOS network and the NVS portal to access data that they used to compare with remote sensing. In a course on Biostatistics, students were tasked with finding an online dataset, which included data available for download from NVS."

– Misty Peacock, Northwest Indian College



Providing up-to-date 24/7 data on the Pacific Northwest

Strengthening Regional Science

"Without NANOOS assets, our ability to effectively monitor the development and effects of ocean acidification in Pacific Northwest coastal waters would be significantly curtailed... we cannot overstate the importance of maintaining NANOOS's infrastructural, data management, and outreach assets for the successful development of NOAA's West Coast and national ocean acidification monitoring networks and information products."

– Richard Feely, Senior Fellow, NOAA Pacific Marine Environmental Laboratory

"The treaty Indian tribes in western Washington are resource managers and acknowledge the positive partnerships that the NANOOS program has worked to build and maintain with tribal governments and programs, and the benefits that this is providing. The tools and products provided by NANOOS, especially the NVS Data Explorer and climatology apps, are an essential tool in my work to support the Tribes. The ease of access to data and data products from a range of different platforms and sources greatly simplifies the process of assessing the current state of the marine environment, while tools such as J-SCOPE provide a valuable resource for planning ahead."

– Tommy Moore, Oceanographer, Northwest Indian Fisheries Commission

"As Superintendent of Olympic Coast National Marine Sanctuary (OCNMS), I enthusiastically endorse the valuable data and services provided by the Northwest Association of Networked Ocean Observing Systems (NANOOS), many of which greatly enhance our understanding of ocean ecosystem dynamics influencing conditions within OCNMS. Thank you for your continued dedication to serving the community of resource managers and users in our region so effectively and collaboratively."

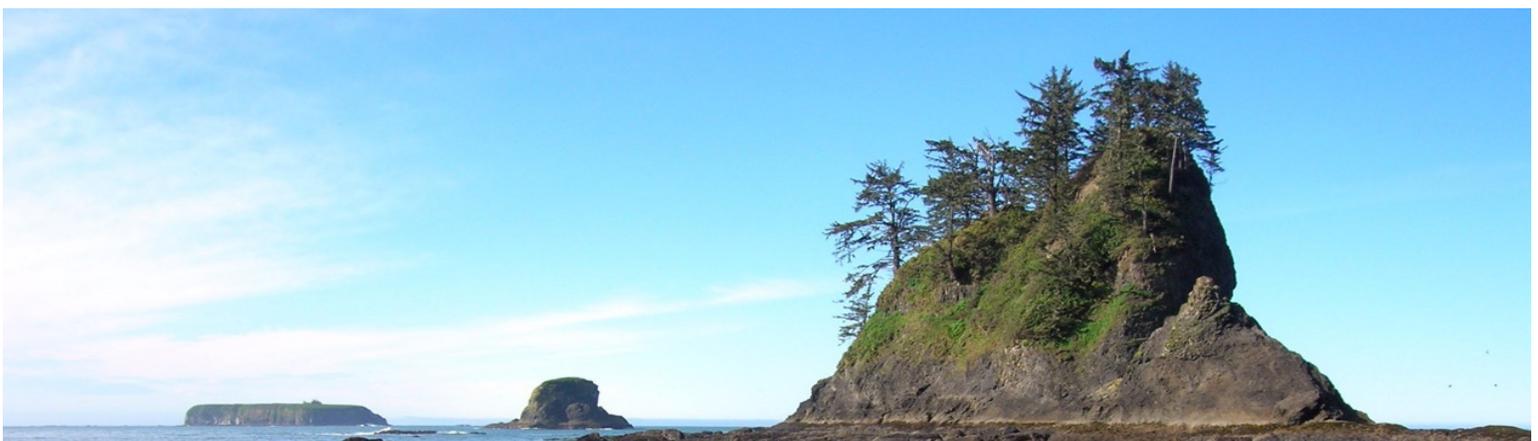
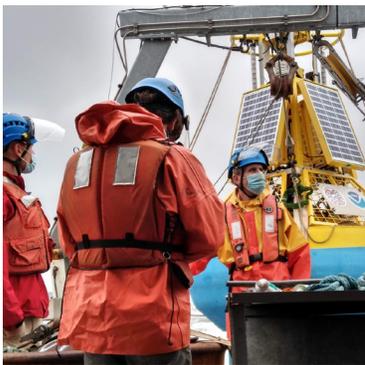
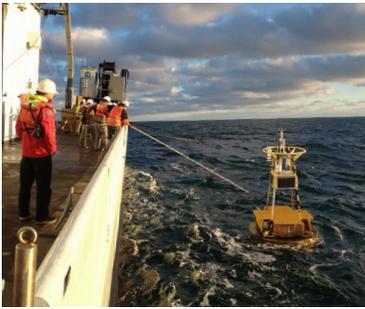
– Carol Bernthal, Superintendent, Olympic Coast National Marine Sanctuary

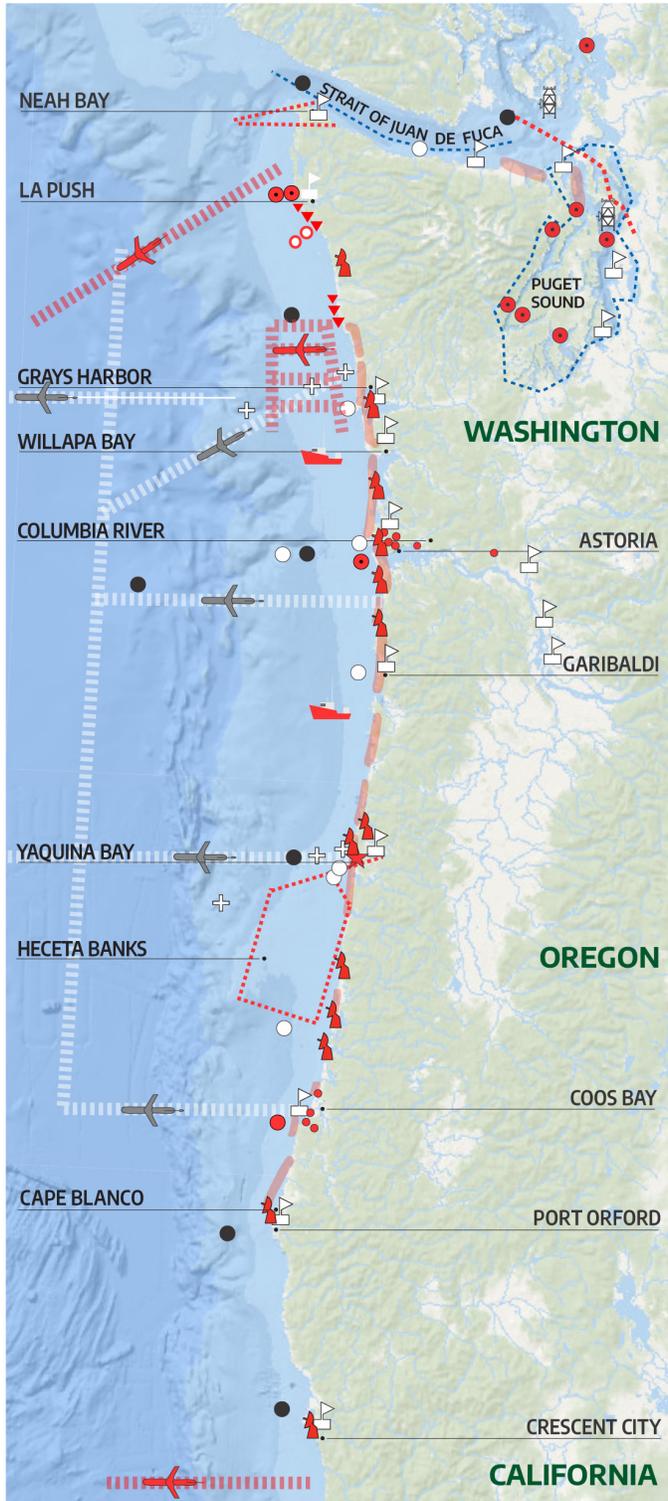
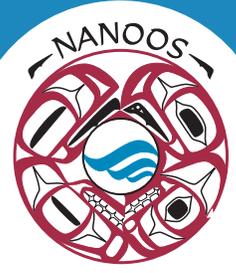
"The West Coast Ocean Data Portal (WCODP) seeks to increase access to and discovery of critical ocean and coastal data for resource managers and policymakers on the West Coast. The ocean observing information provided by NANOOS are important resources for us to highlight in our data catalog, so that our users (namely the state, tribal and federal agencies represented in the West Coast Ocean Alliance, or WCOA) can access the most up-to-date data and models to inform their decision-making at local and regional levels."

– Andy Lanier and Stephen B. Weisberg, Co-Chairs, West Coast Ocean Data Portal

"I anticipate my group will continue to use NANOOS' LiveOcean model in collaboration with several colleagues, as we seek to expand seafloor pressure geodesy studies in Cascadia to search for shallow slow slip earthquakes. The availability of a good long-lived regional oceanographic circulation model is essential for supporting these studies, which are likely to require at least a decade of observations. The geodetic work is critical for improving our understanding the fault mechanics of the Cascadia megathrust and its tsunamigenic potential."

– William S.D. Wilcock, Jerome M. Paros Endowed Chair in Sensor Networks, University of Washington



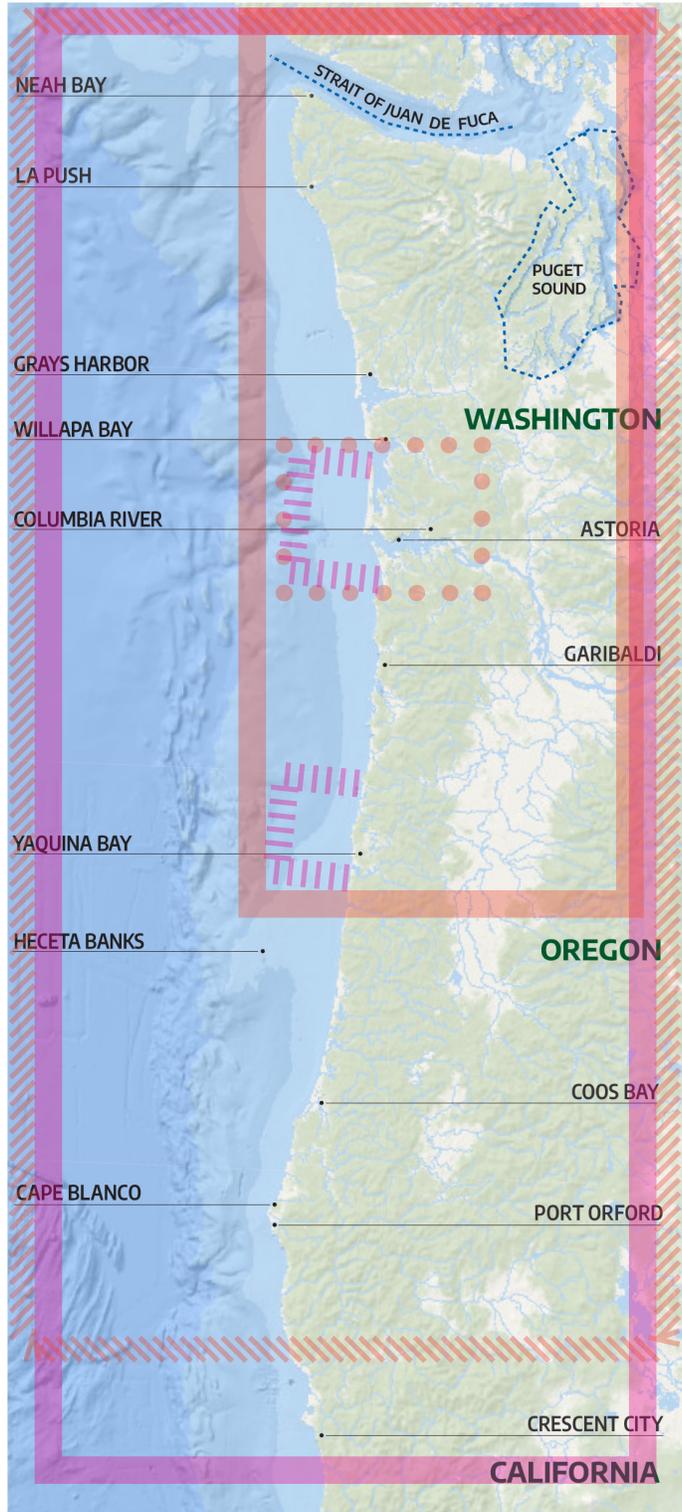
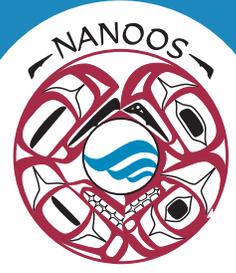


Existing assets to be sustained in partnership:

- Existing coastal and estuarine buoys
- Existing fixed estuarine moorings
- Existing glider tracks
- Existing long-range (180 km) or standard range (50 km) HF radar site
- Cooperative Fisheries Research
- ★ Port X-band wave radar
- Beach and shoreline assessment; includes multiple sites where nearshore bathymetry is being collected.
- Puget Sound ferry box
- Lightfish HAB water samplers
- Landers (Quileute Tribe)
- ▼ Backyard Buoys

Federal assets:

- Existing glider tracks (NSF OOI)
- NSF OOI moorings
- NDBC buoys
- CDIP buoys
- NOS Tide gauges
- CMAN station



Existing assets to be sustained in partnership:

-  OSU ROMS
-  UW LiveOcean
-  CRITFC Virtual Columbia River
-  OSU Waves & Currents @ Ports & Harbors

Federal operational forecasts:

-  Salish Sea Columbia River Operational Forecast System (SSCOFS)
- Global Wave Watch III Forecast
- Full Domain North American Mesoscale (NAM) Meteorological Forecast



NORTHWEST ASSOCIATION OF NETWORKED OCEAN OBSERVING SYSTEMS

Providing up-to-date 24/7 data on the Pacific Northwest

What People Are Saying About NANOOS

"I'm a regular user of NANOOS products, especially the NVS Fishers and SeaCast apps. Recreational tuna and ground fishers use this data when deciding if it's safe to go out and where they should go, and commercial crab fishers use it to decide which way to lay their gear. I am very interested in the continued evolution and improvements of these products."

– Mark McCulloch, Oregon Fisher

"The data available through NANOOS is so important for Oregon fishers. I look at it every time I go out and depend on the information to get me where I need to go and get me back safely."

– Tony Hechert, Oregon Fisher

"NANOOS has really been a valuable partner in this effort to raise awareness about ocean and coastal issues with the ocean recreational user community. A few years ago we collaborated to develop a beach user and a surfer app so that folks had information on water quality monitoring as well as swell, tide, wind, and wave conditions so that they can make informed and safe decisions on where and when they recreate."

– Gus Gate, Surfrider Foundation

"The Emergency Volunteer Corps of Nehalem Bay is a non-profit organization that's dedicated to providing methodologies for resilience and focusing on emergency preparedness when people in our area could be displaced for any number of reasons. It's important that they go to a site that provides them safe haven. By using the NVS Tsunami app we're improving our preparedness and I can't thank NANOOS enough for the mapping and evacuation routes that they provided to us. Without those we'd be a step behind."

– Lee Hiltenbrand, Emergency Volunteer Corps of Nehalem Bay

"NANOOS has helped us expand our capabilities for early warning of harmful algal blooms that can affect coastal shellfish. Instruments purchased with NANOOS funds allow us to test for the toxins that the phytoplankton are producing in seawater samples that are collected by our partners."

– Vera Trainer, Olympic Natural Resources Center

"NANOOS gives us the opportunity to be bigger than the sum of our parts. Being a part of NANOOS provides context of how our Puget Sound and Coastal Bay monitoring data fits in with West Coast processes and other monitoring programs. Some of these programs go beyond Washington's borders giving information that we would otherwise not get."

– Julianne Ruffner, Washington State Department of Ecology

"There's an app! NVS Tsunami Evacuation. It's free – [access] it now! This is a really awesome website – type in your address and see where you are in relation to local and distant earthquakes/tsunamis. And keep in mind that in the event of a larger tsunami, your roads/routes will likely go through the inundation zones...good idea to make a plan now so we are all a little more ready for next time." "This is a great tool to see if you're in a tsunami safe zone or evacuation area! Stay prepared friends!" "This is awesome!!! And I'm going to print this part out to hand out to cars passing by on the next alert! Perfect."

– Oregon coastal residents

"NANOOS has always led the way in working collectively with operators, scientists, educators, tribal, federal, state, and local governments, as well as industry and non-profit organizations and the public to deliver data products and services that are impactful for our region."

– Andrew Barnard, Oregon State University

"The NANOOS Visualization System is an extraordinary resource for our region. It brings together this huge range of real-time observations and models. For me as the developer of the Live Ocean daily forecast model, NANOOS is this platform that allows me to freely share the three-day forecasts with the public in a way that I never could do myself."

– Parker MacCready, University of Washington

