The Blue Economy: Advancing American Fisheries, Maritime Strength and Coastal Economies

Chairman Sullivan, Ranking Member Blunt Rochester, and distinguished Members of the Committee, thank you for inviting me to participate in today's hearing. It is an honor and I commend you for focusing on the importance of growing the Blue Economy.

My name is Nathan Wardwell, Managing Partner of JOA Surveys, a small business in Anchorage, Alaska providing coastal mapping services nationwide for more than 20 years. After completing graduate studies at the University of New Hampshire in ocean mapping, I have participated in projects from the Arctic Ocean to the Caribbean Sea to the Great Lakes, giving me a regional and national perspective on coastal and maritime geospatial challenges.

Navigation, Commerce, and the Cost of Incomplete Data

Underkeel clearance, the vertical distance between a vessel's keel and the seafloor, is one of the most fundamental safety parameters in maritime operations. Accurately calculating it requires three interlocking systems: high-resolution bathymetry, real-time water levels, and a consistent vertical datum tying them together.

The degree to which authoritative data is available for monitoring underkeel clearance varies from port to port. Consider the Port of West Sacramento and its 43-mile Sacramento Deep Water Ship Channel. Bar Pilots navigating that channel have confirmed that most vessels draft deeply enough to require tidal consideration on every transit, meaning shippers cannot fully load vessels given current depth limitations, and cargo moves at a fraction of each ship's capacity[1]. A real-time water level station tied to a consistent datum was required before pilots could safely navigate the channel while maximizing vessel load capacity.

At the Port of Alaska, with seasonal sea-ice and a 30-foot tidal range, vessels supplying goods to 90 percent of Alaska's population depend on the same authoritative bathymetry and real-time water levels[2]. Yet across Alaska, marine pilots serving remote coastal communities routinely navigate without current bathymetry or real-time water levels along their routes.

Tracy Arm Landslide: Observation Infrastructure

On August 10, 2025, a landslide above South Sawyer Glacier sent 64 million cubic meters of rock into Tracy Arm fjord, generating the second-highest megatsunami ever

[1] U.S. Army Corps of Engineers, San Francisco District. Sacramento River Deep Water Ship Channel Limited Reevaluation Report — Appendix E: With-Project Economic Analysis (Draft). February 2011. https://www.spn.usace.army.mil/Portals/68/docs/SRDWSC/Appendix_E.pd
[2] Don Young Port of Alaska. About Don Young Port of Alaska. Port of Alaska, City of Anchorage. Accessed 2026. https://www.portofalaska.com/about-us/

recorded, with runup reaching nearly 1,600 feet above sea level[3]. Water level stations in Juneau and Endicott Arm detected a tsunami signal generated from the event[4]. These stations provided the observational record researchers need to reconstruct wave propagation and model future hazards. Without datum-referenced water level stations distributed across Southeast Alaska, that science cannot be done.

The economic consequences of this event are already being felt: five major cruise lines have removed Tracy Arm from their 2026 itineraries, redirecting passengers to Endicott Arm[5]. Increased cruise tourism in Alaska's fjords increases exposure to exactly these cascading geological risks. Observation infrastructure must grow with the industry.

Western Alaska: The Flood Imperative

When Typhoon Merbok struck the Yukon-Kuskokwim Delta in September 2022, it impacted more than 35 Alaska Native communities along 1,300 miles of coast[6]. In 2024 the community of Kwigillingok experienced coastal flooding with water levels higher than the community members remember experiencing. The next year Typhoon Halong devastated Kwigillingok along with over 40 more communities in the Yukon-Kuskokwim Delta region[7]. In many of these communities, emergency managers navigate blind and rebuilding efforts are hampered by a lack of observational data. These storms are not unique to Alaska. What remains unique is the real-time observational gap.

GNSS-IR: Innovative Blue Economy Technology

My company has been developing and deploying GNSS Interferometric Reflectometry, GNSS-IR, for water and ice level monitoring in Alaska since 2017, working with local, state, and federal stakeholders to expand the coastal and river observing networks across the state[8]. GNSS-IR is a remote sensing technique that measures water and ice levels using reflected satellite signals[9]. Unlike conventional sensors, GNSS-IR requires no in-water infrastructure, making it well-suited for remote and ice-affected environments. As the Blue Economy grows in the Arctic, this capability becomes

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[3] U.S. Geological Survey. 2025 Tracy Arm Landslide-Generated Tsunami. USGS Landslide Hazards Program, August 2025. https://www.usgs.gov/programs/landslide-hazards/science/2025-tracy-arm-landslide-generated-tsunami

[4] Shugar, D.H. et al. (2026). A 481-meter-high landslide-tsunami in a cruise ship–frequented Alaska fjord. Science, eaec3187. https://doi.org/10.1126/science.aec3187

[5] Travel Market Report. Cruise Lines Pull Tracy Arm from Alaska Itineraries. April 6, 2026. https://www.travelmarketreport.com/cruises/articles/cruise-lines-pull-tracy-arm-from-alaska-itineraries

[6] U.S. Geological Survey. Typhoon Merbok Coastal Community Impacts. USGS Supplemental Appropriations for Disaster Recovery Activities. https://www.usgs.gov/supplemental-appropriations-for-disaster-recovery-activities/typhoon-merbok-coastal-community

[7] Alaska Public Media. Officials Say Storm 'Completely Devastated' Western Alaska Communities (Typhoon Halong). October 13, 2025. https://alaskapublic.org/news/public-safety/2025-10-13/officials-say-storm-completely-devastated-western-alaska-communities

[8] Wardwell, Nathan, Drew Lindow, Reece Robinson, and Jim Mitchell. Adventures in Multipath: Extracting Tides & Water Levels from Noise in Alaska. Presentation at the Alaska Geospatial Summit, April 9, 2025. JOA Surveys, Anchorage, AK. https://joasurveys.com/wp-content/uploads/2025/04/AK-Geosummit-GNSS-IR.pdf

[9] Larson, K.M. GNSS Interferometric Reflectometry: A New Tool for Environmental Sensing. GPS Solutions, 2016. https://doi.org/10.1007/s10291-016-0557-1

increasingly critical. Full-scale adoption requires interagency commitment and investment.

Conclusion

Since the precursor to NOAA's Office of Coast Survey was established by Congress in 1807, our nation has understood the value of mapping its coasts and waters for navigation, land management, national security, and long-term monitoring. Yet in 2024, 46% of U.S. waters remain unmapped[10]. Advancing American fisheries, maritime strength, and coastal economies depends on understanding our ocean and seafloor. That requires strong public-private partnerships and continued investment in ocean technology. Thank you for this opportunity to testify.

[10] Carter, Nicole T., Laura B. Comay, Caitlin Keating-Bitonti, Eva Lipiec, and Linda R. Rowan. Frequently Asked Questions: Mapping of U.S. Ocean and Coastal Waters. Congressional Research Service Report No. R47623, updated July 29, 2025. Washington, DC: Congressional Research Service. https://crsreports.congress.gov/product/pdf/R/R47623