



# Revisiting a National Ocean Acidification Monitoring Network: Current Status, Regional Needs, and Potential Roadblocks



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## Ocean Acidification Monitoring

Under the FOARAM Act (2009), NOAA's Ocean Acidification Program (OAP) supports a variety of ocean acidification observing assets in U.S. Large Marine Ecosystems (Figure 1). Composed of research cruises, stationary moorings, autonomous underwater vehicles, community sampling, and open-source sensor stations, this OA observing network provides critical information about ocean chemistry on daily to interannual timescales.

## Emerging Interests

The reauthorization of the FOARAM Act (2022 CHIPS and Science Act) requires the OAP to provide technical assistance to coastal ocean acidification stakeholders. To assist stakeholders with their observing needs, OAP is thinking of ways to augment the existing OA observing network to further incorporate stakeholder interests from the bottom up.

## To design a robust observing network, the OAP asks:

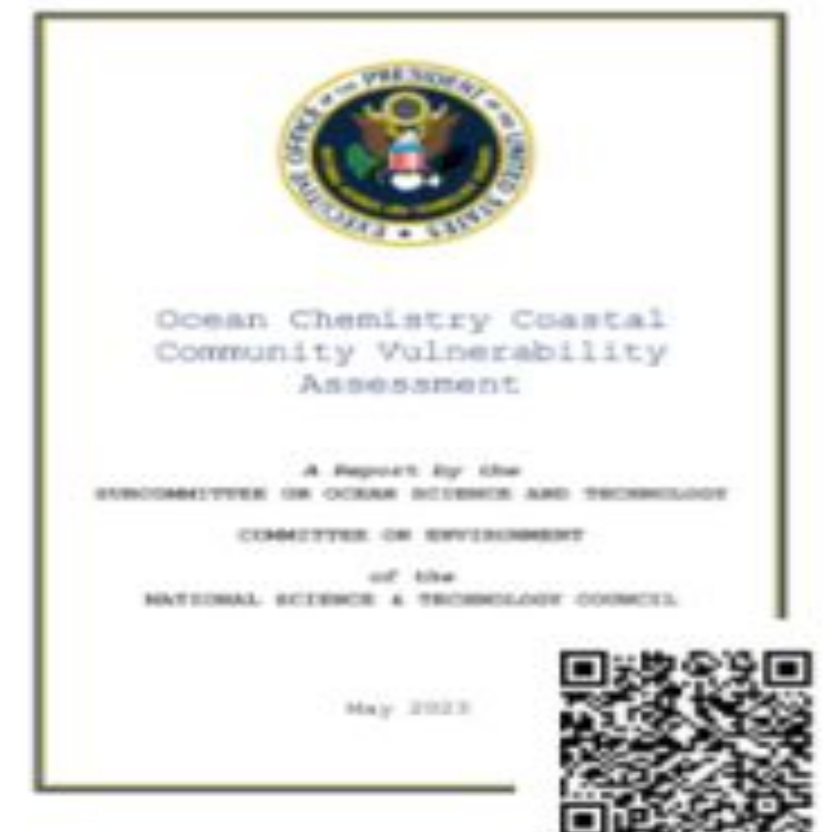
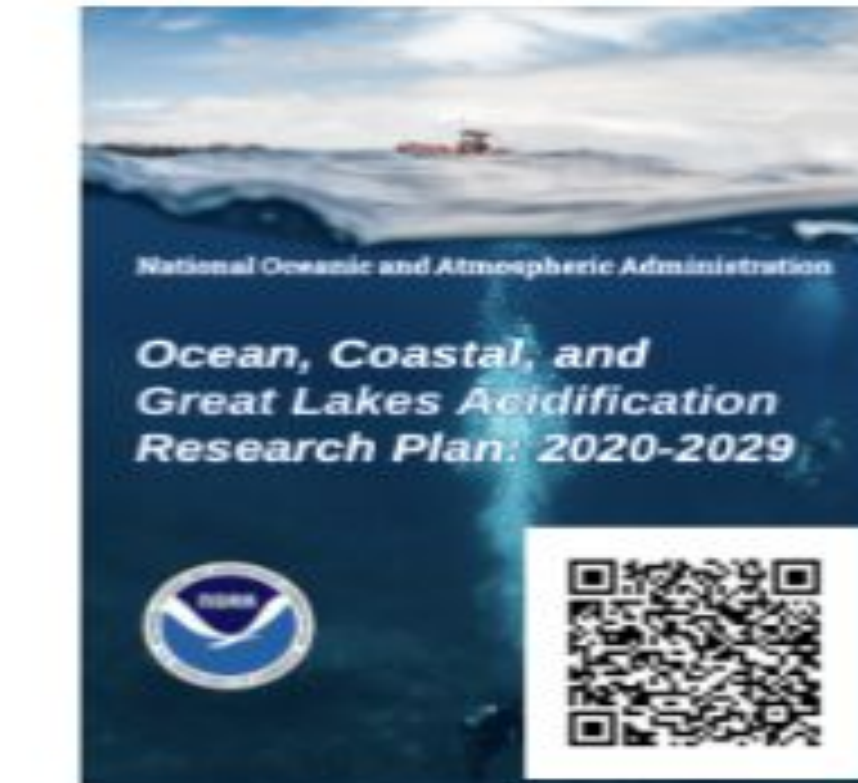
- What do ocean acidification stakeholders want to know?
- What are the ocean acidification observing priorities in different U.S. regions?
- How can existing assets aid in addressing coastal resource management?
- What is the optimal approach for augmenting observing systems in a resource-restricted world?

## Revisiting an ocean acidification monitoring network requires:

- Thorough assessment of stakeholder needs
- Ocean acidification observing expert weigh-in
- Technological advancements in carbonate system sensors and monitoring platforms
- Co-designed observing systems

## The OAP and its partners contribute to a responsive observing system through:

- NOAA and Interagency reports on ocean acidification priorities and vulnerabilities
- Support of and collaboration with Coastal Acidification Networks
- Sponsorship of observing optimization studies, regional vulnerability assessments, and data product development
- Offering funded PIs flexibility to augment observing systems to better address stakeholder needs



## Looking forward

Identifying gaps and priorities is a first step in revisiting a national OA monitoring network. Fostering relationships and co-developing observing systems requires time, effort, and funding. Developing novel sensors and incorporating new platforms into an existing system requires technology readiness and specific platform expertise. The OAP's present actions lay the groundwork for augmenting the existing OA monitoring network to address technical assistance needs. *What OA observing needs do you have? Join your regional CAN or contact OAP to contribute.*

**Figure 1:** Representation of U.S. Ocean Acidification observing assets funded by NOAA OAP, along with stakeholder priorities and opportunities for observing system growth as described by the Interagency Working Group on Ocean Acidification in the 2023 Ocean Chemistry Coastal Community Vulnerability Assessment. Icons next each region name indicate the current OA observing assets in that region.



### West Coast

**Stakeholder priorities:** Biological thresholds, upwelling, commercial and cultural fisheries, aquaculture, OA co-stressors (oxygen, temperature, nutrients, harmful algal blooms).

**Opportunities for growth:** Observing optimization studies for model development; monitoring in benthos, open water, estuaries, and coastal rivers; AUVs, leverage of existing programs and partnerships.



### Great lakes

**Stakeholder priorities:** OA co-stressors (oxygen, algal blooms), water quality.

**Opportunities for growth:** Additional long-term OA monitoring stations, leverage of existing infrastructure, description of baseline OA conditions in the Great Lakes.

### Northeast

**Stakeholder priorities:** Time and space scales relevant to biology, subsurface monitoring, commercial fisheries, living shoreline restoration and carbon sequestration.

**Opportunities for growth:** Measurement of 2+ carbon variables, subsurface monitoring in fisheries zones, estuarine monitoring, leverage of existing programs and assets.

### Mid-Atlantic

**Stakeholder priorities:** Subsurface monitoring, biological co-monitoring, biodiversity, commercial species, ecosystem restoration, Cold Pool, deep sea coral, OA co-stressors (temperature, oxygen).

**Opportunities for growth:** Informing of regional models, enhancement of existing platforms, higher temporal and spatial scales, coverage near-shore.

### Southeast

**Stakeholder priorities:** OA co-stressors (hypoxia, harmful algal blooms, river discharge, eutrophication), coral reef systems, shellfish fisheries, tourism, coastal resilience, benthic ecosystems.

**Opportunities for growth:** Winter and subsurface monitoring, observation of key transition zones and environmental gradients, nearshore sampling, growth of partnerships and existing infrastructure.

### U.S. Caribbean

**Stakeholder priorities:** Coral reef ecosystems, subsurface monitoring, seagrasses, mangroves, soft-bottom sediment, OA co-stressors (warming, coral disease).

**Opportunities for growth:** Coupled biological and chemical monitoring, target species with known OA sensitivity (calcifiers, bioeroders), leverage of existing observing assets, expansion of monitoring stations.

### Alaska

**Stakeholder priorities:** Commercial and subsistence fisheries, OA in culturally significant habitats or tribal lands, geographically isolated communities.

**Opportunities for growth:** Higher spatial and temporal coverage, co-location of ship-based surveys with fishery hotspots, capacity building, leverage of existing networks.

### U.S. Pacific Islands

**Stakeholder interests:** Finfish fisheries, coral reef ecosystem health, highly migratory protected species.

**Opportunities for growth:** Offshore sampling, monitoring across regional-scale gradients, capacity building, identification of OA hotspots and refugia.



### Gulf of Mexico

**Stakeholder priorities:** OA co-stressors (hypoxia, harmful algal blooms), commercial and recreational fisheries, cold-water corals, subsurface and seafloor habitats, essential fish habitats (estuaries, seagrasses, mangroves, marshes, oyster reefs).

**Opportunities for growth:** Estuarine sampling, higher temporal coverage, subsurface and open-ocean observing, international collaboration, observing stations in undersampled regions.

- Stationary Moorings
- Uncrewed Systems
- Community Sampling
- Ship Surveys