

## U.S. IOOS FY22

# National Harmful Algal Bloom Observing Network Awards

### Alaska Ocean Observing System (AOOS)

**Funded amount:** \$300,000

**Funding period:** June 2022 - June 2023

Continuing from FY 2020

The presence of harmful algal blooms and their biotoxins in Alaska's waters threatens the availability and safety of important commercial and subsistence shellfish resources, as well as the wild populations of fish, birds, marine mammals, and other species foraging in the marine environment. Climatic changes in Arctic Alaska are resulting in more HABs, signaling a growing potential threat to human and ecosystem health.

The Alaska Harmful Algal Bloom network, formed in 2017, seeks to improve the effectiveness of HAB monitoring and event response across the state. This award supports the nascent network, continuing to support a full-time AHAB coordinator and statewide action plan; ensures that data are collected, synthesized, and accessible through a central portal; and incorporates proven, cost-effective technologies, such as qPCR testing for *Alexandrium* (the cause of paralytic shellfish poisoning) and field test kits for domoic acid, an algal toxin produced by multiple species of *Pseudo-nitzschia*, into operational monitoring across Alaska. With FY 2022 funds, and in addition to supporting the network coordinator, the Alaska Ocean Observing System and AHAB will improve statewide testing capabilities by supporting the lab testing capacity for algal toxins, promoting the development and testing of saxitoxin field tests, and providing funding to have samples tested at the State of Alaska lab. In the future, the project aims to conduct a HAB monitoring project and to develop forecast modeling for HABs in Alaska.

### Caribbean Coastal Ocean Observing System (CARICOOS)

**Funded amount:** \$200,000

**Funding period:** June 2022 - June 2023

New Award

The Caribbean region has been experiencing severe and disruptive *Sargassum* blooms. In order to better predict and manage these blooms, the Caribbean Coastal Ocean Observing System has proposed a two-prong project to monitor and forecast these blooms.

CARICOOS will manage a monitoring program in the La Parguera Marine Reserve on the southwestern coast of Puerto Rico. Ten stations arrayed from the outer keys to the mangrove area will be checked weekly for data showing *Sargassum* loading rate and biochemical impacts.

Additionally, CARICOOS will work to implement and validate a forecast system coupling high-resolution satellite imagery with CARICOOS high resolution hydrodynamic, weather and wave models (FVCOM, WRF and SWAN, respectively), and HFR surface current observations to predict *Sargassum* arrival time and loading level.

For more information, please contact Kate Culpepper, U.S. IOOS, [kate.culpepper@noaa.gov](mailto:kate.culpepper@noaa.gov)

## Central and Northern California Ocean Observing System (CeNCOOS) & Southern California Coastal Ocean Observing System (SCCOOS)

**Funded amount:** \$300,000

**Funding period:** June 2022 - June 2023

Continuing from FY 2020

Identifying and quantifying the diversity of phytoplankton in the waters off of the California coast is vital for monitoring and understanding harmful algal blooms. Nearly every year, recreational and commercial fisheries are closed due to excessive amounts of biotoxins found in shellfish and crustaceans that are produced by harmful algae. This award supports the operation and maintenance of a suite of autonomous water samplers, Imaging FlowCytobots, to identify HAB species in real-time at critical land-based and offshore locations throughout California. Developed at Woods Hole Oceanographic Institution and manufactured by McLane Labs, the IFCB continuously takes images of each particle in a small sample (~15 mL) of water every hour. An onboard computer then uses image recognition processes and a machine-learning model to estimate both the identity and the volume of the phytoplankton.

This project, with additional funding from other NOAA resources and the California Ocean Protection Council, provides an efficient way to quickly and consistently test for HAB toxins off the California coast. NOAA's National Centers for Coastal Ocean Science PCMHAB program is funding a complementary project to develop a data infrastructure for this network. FY 2022 funding will support operations and maintenance as well as data management funds for the California network of twelve IFCBs.

## Gulf of Mexico Coastal Ocean Observing System (GCOOS)

**Funded amount:** \$200,000

**Funding period:** June 2022 - June 2023

Continuing from FY 2020

Commonly called red tide, *Karenia brevis* blooms along the Gulf of Mexico coast can cause respiratory illness and eye irritation in humans. It can also kill marine life and lead to shellfish closures. Blooms are often patchy, so impacts vary by beach and throughout the day. The HABscope, an innovative *K. brevis* sampling tool developed by the Gulf of Mexico Coastal Ocean Observing System and NOAA's National Centers for Coastal Ocean Science, empowers citizen science to manage and mitigate red tide. Trained citizens and scientists can collect water samples, take a video of the sample using a low-cost microscope and iPod, and connect to the GCOOS image recognition software to calculate a cell count. Transitioning to HABScope 2.0 and expanding the HABscope user group allows for increased beach by beach sampling with broader coverage, improving red tide forecasting and better illustrating the potential impacts of any given bloom. Funds will also support a dashboard to display Imaging FlowCytobot data from locations in Texas, Alabama, and Florida.

In addition, GCOOS will continue a testbed pilot project initiated in 2021 to improve detection and forecasting of harmful algal blooms in the Gulf of Mexico. Researchers will acquire and deploy a small suite of autonomous instruments to test their suitability in the turbid waters of the gulf and build both the instrument and personal capacity to operate, maintain and interpret the data from the systems. The project was funded with \$947,000 divided over three years, and results will inform future investments to support HAB forecasting and management through a Gulf of Mexico HAB observing system.

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## Great Lakes Observing System (GLOS)

**Funded amount:** \$370,000

**Funding period:** June 2022 - June 2023

Continuing from FY 2020

Lake Erie is a vital resource for the U.S. It supports jobs, tourism, and — critically — drinking water for more than 11 million people. Lake Erie harmful algal blooms consist of cyanobacteria, also called blue-green algae, capable of producing the liver toxin microcystin which poses a risk to human and wildlife health. Such blooms may result in higher costs for cities and local governments that need to treat drinking water; prevent people from enjoying fishing, swimming, boating, and visiting the shoreline; and harm the region's vital summer tourism economy. The Great Lakes Observing System has partnered with a broad group of stakeholders to develop and operationalize an early warning system for Lake Erie to support decision making to take steps for public safety when facing these blooms. FY 2022 funding allows for the testing and deployment of uncrewed vehicles (3G ESP/SeaTrac ASV) in western Lake Erie, which can be deployed to areas of concern identified by hyperspectral imaging. Funds will also be allocated to test and deploy an autonomous submersible holographic imaging system (AUTOHOLO), which can provide cell counts of many different plankton species in a non-invasive manner.

Finally, this project will also expand the near real-time monitoring system in Green Bay, Wisconsin. Wisconsin's Fox-Wolf basin, which flows into Green Bay, is one of the four EPA-designated algae bloom hotspots in the Great Lakes and the Lower Green Bay is one of the International Joint Commission-designated Areas of Concern.

## Mid-Atlantic Regional Association Coastal Ocean Observing System (MARACOOS)

**Funded amount:** \$100,000

**Funding period:** June 2022 - June 2023

New Award

The Mid-Atlantic Regional Coastal Ocean Observing System is developing harmful algal bloom prediction and response capabilities focused on the particular needs of the Mid-Atlantic region where blooms can kill fish and shellfish and have severe impacts on fisheries and aquaculture. This funding will enable MARACOOS to inventory current projects and related technology, identify gaps, and work with technology partners to create options for a harmful algal bloom tool targeted toward Mid-Atlantic stakeholders. In addition, funding will go toward integrating and maintaining HABs-focused data sources such as monitoring data and forecasts into the MARACOOS data management and cyberinfrastructure subsystem, including data that are currently in private networks, ensuring that the data are compliant with NOAA certification requirements and U.S. Integrated Ocean Observing System standards.

## Northwest Association of Networked Ocean Observing Systems (NANOOS)

**Funded amount:** \$430,000

**Funding period:** June 2022 - June 2023

Continuing from FY 2020

Harmful algal blooms have made a sizable impact on the economic and human health of the Pacific Northwest region, prompting frequent fishery closures and disrupting jobs, tourism, and food supply chains. The Pacific Northwest Harmful Algal Bloom Bulletin — a forecast based on field observations and modeling output — has been providing critical, timely information to state and tribal managers in both Washington and Oregon since 2017. Data, information, and forecasts in the bulletin support decision-making for opening or closing shellfisheries, including delayed openings; selective harvests at “safe” beaches; and harvest limits, protecting the health of tens of thousands of harvesters and consumers in the region. This award will be used for a combination of salary support, LiveOcean ocean circulation modeling, offshore sampling, beach sampling, and sample analysis.

FY 2022 funding will support the critical HAB bulletin by providing an analyst and training a back-up analyst, bringing a modeler on board, and coordinating with Northwest Association of Networked Ocean Observing Systems data. In addition, funds will be used to work with the four coastal treaty tribes (Hoh, Quinault, Quileute, Makah) for offshore sampling and analysis, with the State of Oregon for beach sampling and analysis, and engaging the Oregon and Washington fishing fleet in the co-production of an offshore plankton observatory. Finally, funds will be used to augment the spring Environmental Sample Processor HAB mooring deployment and HAB analysis in Puget Sound as part of the SoundToxins partnership.

## Northeastern Regional Association for Coastal Ocean Observing Systems (NERACOOS)

**Funded amount:** \$300,000

**Funding period:** June 2022 - June 2023

Continuing from 2021

Historically the only harmful algal bloom in the northeast region was the toxic dinoflagellate *Alexandrium catenella*, a globally widespread cause of paralytic shellfish poisoning. In recent years, however, other biotoxin threats have emerged with blooms of *Pseudo-nitzschia* diatoms and *Dinophysis* dinoflagellates causing shellfish closures for amnesic shellfish poisoning and diarrhetic shellfish poisoning. This project is working to demonstrate an alternative approach to Imaging FlowCytobot deployment and sampling that would offer capacity for mobility and reduce the overall costs of deployments. Funds will support the deployment of an autonomous solar vehicle (SeaTrac SP-48) in New Hampshire waters in cooperation with the Woods Hole Oceanographic Institute and the New Hampshire Department of Environmental Services. The vehicle has a dedicated conductivity-temperature sonde with complementary fluorescence sensors made by AML Oceanographic, supplemented with a suite of upgrades that tailor an IFCB for optimal performance aboard a mobile platform. Crucially, these upgrades allow for on-board classification of IFCB images, an essential capability for deployments to high-need regions of the Northeastern Regional Association of Coastal Ocean Observing Systems domain that are not served by cellular data coverage.

Additionally, funding will support the purchase of a new nutrient sensor (SeaBird Scientific SUNA) for the NERACOOS Integrated Nutrient Observatory in partnership with The University of Maine. The observatory is integrated within the Gulf of Maine buoy network operated by the lab of Dr. Neal Pettigrew at the University of Maine.

For more information, please contact Kate Culpepper, U.S. IOOS, [kate.culpepper@noaa.gov](mailto:kate.culpepper@noaa.gov)

## Pacific Islands Ocean Observing System (PacIOOS)

**Funded amount:** \$130,000

**Funding period:** June 2022 - June 2023

New Award

Ciguatera fish poisoning, an illness caused by toxins from the microalga *Gambierdiscus*, can lead to diarrhea, paralysis, and, in worst cases, death. It occurs in Hawaii, Guam, southern Florida, Puerto Rico, the U.S. Virgin Islands, and occasionally up into the southeastern U.S., posing significant risk to fisheries and human health. Supporting a research coordinator and providing the opportunity to build relationships with collaborators within and outside of the U.S. Affiliated Pacific Islands is a critical first step in managing the threat of CFP.

This Pacific Islands Ocean Observing System program would help establish partnerships between ongoing research and monitoring efforts in other regions with the needs and issues faced by communities in the USAPI and other Pacific nations. This includes support for a part-time research and network coordinator who can establish these working relationships and also foster collaborations in the USAPI and in other parts of the United States as well as a series of virtual working group meetings to bring together regional stakeholders with experts from other regions who are actively involved in research addressing CFP. The coordinator would also be responsible for fostering connections with colleagues at other IOOS Regional Associations facing similar challenges in terms of the complexity of stakeholders, geographic scope, and data-limited monitoring programs, such as Alaska's AOOS.

## Southeast Coastal Ocean Observing Regional Association (SECOORA)

**Funded amount:** \$150,000

**Funding period:** June 2022 - June 2023

Continuing from 2021

Impacts from harmful algal blooms are increasing throughout the southeast, with significant incidences of red tide on the Florida west coast and *Sargassum* blooms throughout southeast Florida and the Keys. This funding will build on previous west Florida HAB monitoring, tracking, and forecasting efforts, which includes *Sargassum* forecasting. A number of predictive tools are in development to investigate this natural phenomenon, which has both biological and physical dimensions.

FY 2022 funding will support a continuing *Sargassum* modeling project as well as a new RFP for projects that align with the Southeast Coastal Ocean Observing Regional Association's newly finalized [regional HAB Plan](#). The selection process for projects funded under the RFP will include HAB experts, including those from NOAA's National Centers for Coastal Ocean Science.

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