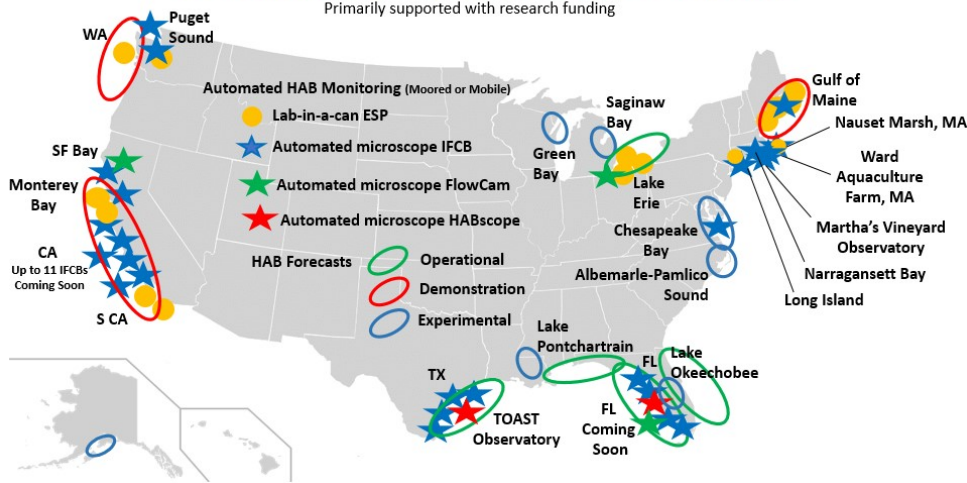


Coastal HAB Monitoring and Forecasting

Primarily supported with research funding



5 HUIRZWK %P RQVLUQ
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 &UHGLW12\$\$

Causes and Toxicity of HABs: NOAA conducts research to understand the causes and impacts of HABs and their toxins. This includes improved understanding of the factors controlling HAB growth and toxicity by focusing on harmful algal genetics, physiology, and toxin production. NOAA and partners are also investigating the [trophic transfer](#) of HAB toxins across marine food webs, and the impacts of these toxins on higher trophic levels.

HAB Monitoring and Toxin Detection: NOAA supports a wide range of monitoring and observing networks (ex. [HABSOS](#), [IOOS Regional Initiatives](#)) many of which are a collaboration between internal NOAA and external partners. Observations and measurements of HAB species and toxins are key to supporting early warning and forecasting. NOAA and partners have developed new technologies to better monitor HABs and improve real-time sampling with [Imaging FlowCytobot](#) and toxin and genetic identification of algae with [Environmental Sample Processor](#). The data collected by these technologies are useful in assessing bloom toxicity, identifying potential drivers of HAB growth and toxin production, and validating satellite observations and model outputs.

HAB Forecasting: NOAA and its partners use satellite remote sensing data, *in situ* observations, and numerical modeling to support a system for detecting, monitoring, and forecasting HABs across the US. Operational forecasts are provided for the eastern and western regions of the [Gulf of Mexico](#) and Lake Erie, demonstration forecasts are available for the [Gulf of Maine](#), [California](#), and the [Pacific Northwest](#). Experimental forecasts are being developed for Alaska, Lake Okeechobee, and the Chesapeake Bay. By incorporating advances in observational science and modeling, it is possible to improve HAB forecasts. HAB forecasting products serve as decision-support tools and provide early warning of regional blooms for local coastal resource managers, public health officials, and research scientists.

HAB Prevention and Control: NOAA scientists and partners are working to eliminate or control HABs, in ways that are safe for people, wildlife, and the environment. For example, some naturally occurring [marine bacteria](#) can target and kill

toxic algae. NOAA is also transitioning to large-scale operations environmentally sustainable technologies like [nanobubble ozone technology](#) (NBOT), which can eliminate harmful algae and their toxins. NBOT has also been successful in reducing or completely removing nitrogen and phosphorus from the water column. This research is in the process of being field tested.

Response and Readiness for HAB Events: NOAA provides [analytical support and funding assistance](#) during HAB and marine mammal mortality events. NOAA released approximately \$111,360 in event response funds from July 2019 to March 2021 to assess and research ongoing HABs, toxin levels, impacts to marine animals, potential treatment methods for affected animals, and to support community toxin detection in response to a HAB event caused by warming waters.

Addressing HAB Impacts - Humans, Ecosystems and Economies: NOAA researchers have partnered with private industry to develop portable test devices to measure toxins in [drinking water](#) and [harvested shellfish](#). NOAA empowers Native American tribes to [establish laboratories](#) that allow for quicker testing of samples for toxins in traditional and subsistence resources. NOAA also uses the power of citizen science to expand HAB [forecasts](#) and [monitoring](#). Finally, NOAA is working to estimate the economic benefits of the HAB early warnings provided by forecasts.

Significance of NOAA HAB Research

NOAA's HAB research capabilities and assets, together with information collected by partners through state-led programs and other Federal agencies, enhance the understanding of the causes of HABs and how they respond to changing weather, ocean conditions, and other factors. Early warning of HABs provides health officials, environmental managers, and water treatment facility operators information to focus their testing to guide beach and shellfish bed closures or water treatment in a more appropriate timeframe; decrease costs for states, tribes, and local governments in monitoring and managing HABs and their impacts; and allow the seafood and tourism industries to minimize HAB impacts.