NCCOS | NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

NOAA'S ECOLOGICAL FORECASTING

Ecological forecasts use measurements of the physical and biological environment to predict ecological conditions that can impact natural resources, people, communities, and economies. NOAA aims to deliver accurate, relevant, timely, and reliable ecological forecasts that power the blue economy and build climate resilience. These products and services are made available to coastal resource managers, private industry, and the public.

Harmful algal blooms (HABs) Forecasts

HABs occur in every state and are changing in frequency, toxicity, and duration. Both toxic and non-toxic HABs threaten human and marine mammal health, drinking water, tourism, commercial and recreational fisheries, and aquaculture. Short-term HAB forecasts predict the intensity, location, and trajectory of blooms, and respiratory health risks of HABs in some areas. Longer-term forecasts predict the severity of HABs for the bloom season in a particular region. Scenario forecasts are used to test the impact of changing environmental conditions, such as nutrient pollution and climate change, on HAB occurrence over multi-year time scales. Forecasts and early warning allow effective mitigation of HAB impacts and facilitate HAB prevention.

Hypoxia Forecasts

Hypoxia (low oxygen) has dramatically increased in U.S. coastal systems, with large "dead zones" in Lake Erie, Chesapeake Bay, and Gulf of Mexico occurring annually. The consequences of such large dead zones include massive fish kills, loss of fisheries habitat, and economic losses in commercially and recreationally valuable fishies. In Lake Erie, hypoxic water reaching the water intake for cities along the coast can affect water treatment, potentially impacting approximately 2 million residents. NOAA hypoxia forecasts aim to provide coastal managers and stakeholders with the information needed to take proactive action to mitigate the impacts of an ongoing hypoxic event, and to set the nutrient reduction targets necessary to reduce the frequency and magnitude of future events.

Pathogen Forecasts

Each year, an estimated 80,000 vibriosis illnesses and 100 deaths in the United States occur related to Vibrio bacteria. The majority of these result from consumption of raw or undercooked seafood contaminated with *Vibrio parahaemolyticus*, or by exposing a wound to seawater that is contaminated with *Vibrio vulnificus*. NOAA's Vibrio forecasts show where and when to expect elevated concentrations. Shellfish growers use the *Vibrio parahaemolyticus* forecast to plan harvest and refrigeration strategies, allowing them to get more of their product to market and keeping consumers safe. The *Vibrio vulnificus* forecasts are used by public health agencies to guide monitoring, inform beach and fishing advisories, and to educate the public.

Forecasting Shifts in Species and Habitats

Climate change is driving shifts in the distribution, abundance, and productivity of coastal species and associated habitats. Protecting and restoring these resources requires understanding and planning for the impacts of climate change. NOAA has, and will continue, to advance our understanding on the sensitivity and resiliency of coastal habitats to coastal changes and forecast how ecosystems will respond to various climate stressors. Thus, NOAA scenario forecasts are used to test the impact of changing environmental conditions, such as sea level rise and temperature, over multiple time and space scales. Results are used to prioritize and site conservation and restoration initiatives and to inform the spatial management of living resources in estuarine, coastal, and marine waters.

NOAA'S ECOLOGICAL FORECASTING BY REGION

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Northwest

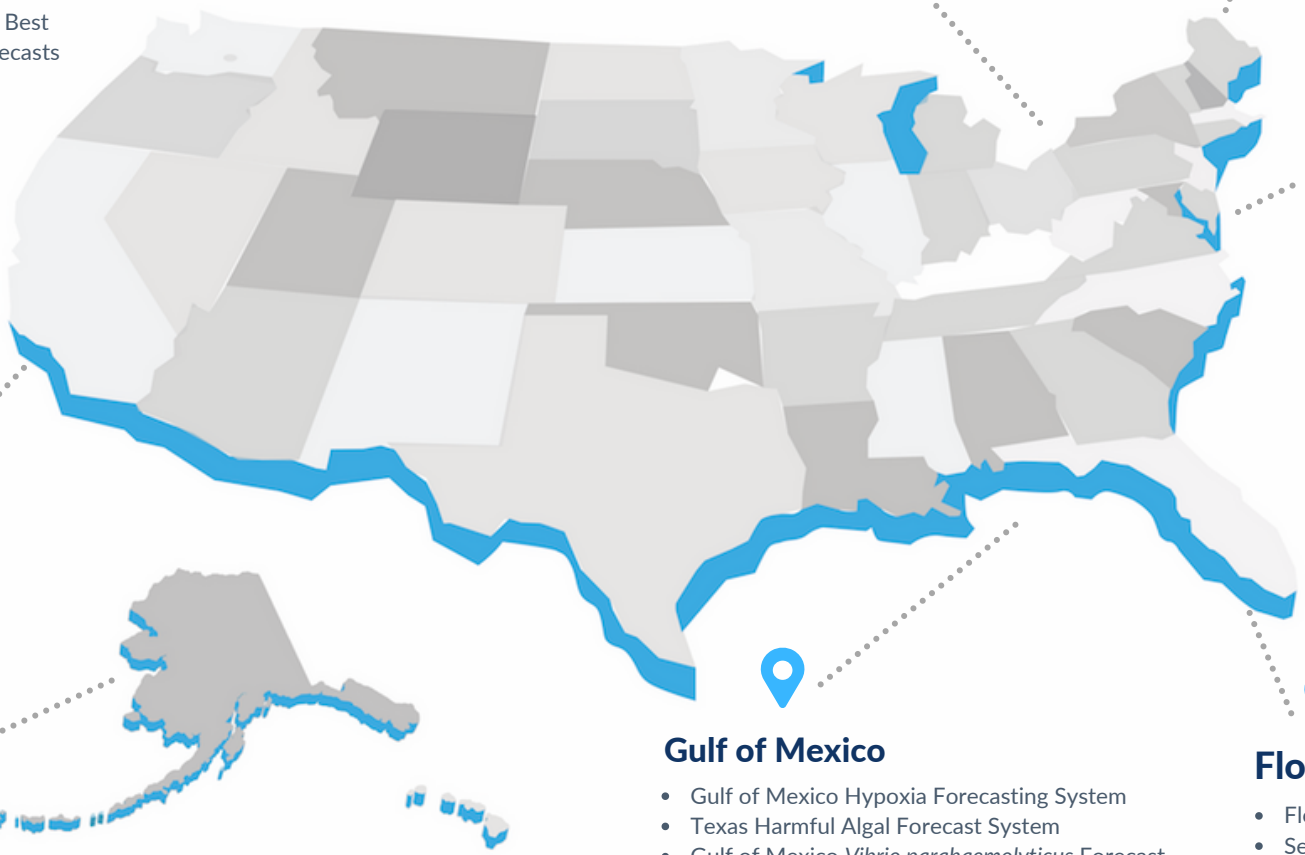
- Puget Sound Vibrio forecast
- Pacific Northwest HAB Forecast Bulletin
- Puget Sound Scenario Forecast
- Puget Sound Regional Best Harvest Guidance Forecasts

Great Lakes

- Lake Erie Hypoxia Forecast
- Western Lake HAB Early Season Projection
- Lake Erie HAB Seasonal Forecast
- Lake Erie HAB Nowcast and 5-Day Forecast

Northeast

- Gulf of Maine HAB Forecast
- Gulf of Maine Seasonal HAB Forecast
- Massachusetts Coastal Waters Regional Best Harvest Guidance Forecasts
- New Hampshire Coastal Waters Regional Best Harvest Guidance Forecasts
- Northeast Habitat Climate Vulnerability



Mid-Altlantic

- Chesapeake Bay Hypoxia Forecast
- Chesapeake Bay Scenario Forecast
- Chesapeake Bay *Vibrio vulnificus* Forecast
- Chesapeake Bay *Vibrio parahaemolyticus* Forecast
- Long Island Sound Regional Best Harvest Guidance Forecasts
- Delaware Coastal Bays Regional Best Harvest Guidance Forecasts
- Estuarine Species Distribution in Response to Climate Change

Southwest

- California Harmful Algae Risk Mapping

Alaska

- Alaska Harmful Algae Risk Mapping

Gulf of Mexico

- Gulf of Mexico Hypoxia Forecasting System
- Texas Harmful Algal Forecast System
- Gulf of Mexico *Vibrio parahaemolyticus* Forecast

Florida

- Florida Harmful Algal Forecast System
- Seasonal Karenia forecast West Florida Shelf
- Tampa Bay *Vibrio parahaemolyticus* forecasts

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