

# NOAA'S ECOLOGICAL FORECASTING

Ecological forecasting predicts how ecological events, like harmful algal blooms, may impact human health, food, water, and the environment. NOAA aims to deliver accurate, relevant, timely, and reliable ecological forecasts that power the economy and support healthy American communities. These products and services are made available to coastal resource managers, private industry, and the public.

## Harmful Algal Bloom (HAB) Forecasts

HABs occur in every state and are increasing in frequency, toxicity, and duration. Both toxic and non-toxic HABs threaten human, wildlife, and ecosystem 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 on HAB occurrence over multi-year time scales. Forecasts and observations allow early warning for 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 the Gulf of America 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 fisheries. In Lake Erie, hypoxic water reaching the water intake for cities along the coast can affect water treatment, potentially impacting approximately two 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

*Vibrio* bacteria are endemic to United States coastal waters, with some species capable of causing human illness. The majority of these result from either 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 *Vibrio*, and support efforts to limit growth post harvest. Shellfish growers use the *Vibrio parahaemolyticus* forecasts to plan harvest and refrigeration strategies, allowing them to get more of their product to market and keep 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

Changing environmental conditions are driving shifts in the distribution, abundance, and productivity of coastal species and associated habitats. Protecting and restoring these resources requires understanding and planning for these impacts. 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

