Florida Red Tide (*Karenia brevis*) Impacts and How the National Estuary Programs Can Help

What is the current Florida red tide event?

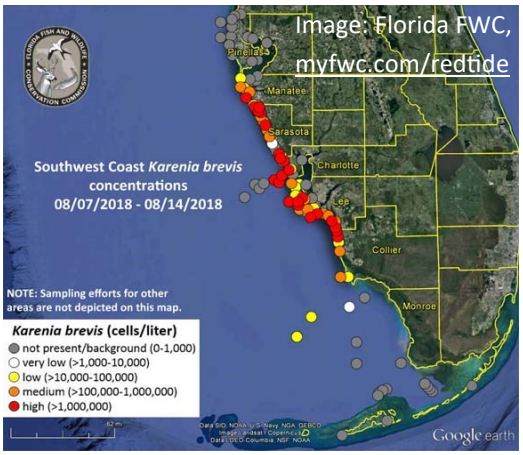
Florida's current red tide event, a type of harmful algal bloom (HAB), results from the proliferation of *Karenia brevis*, an algal species typically found in low concentrations in offshore coastal waters.

Karenia brevis can move toward shore and reach bloom concentrations in response to factors that are physical (*e.g.*, tides, currents, and water temperatures), chemical (*e.g.*, nutrients and salinity), and biological (*e.g.*, outcompeting other algal species).

Human activities can exacerbate most harmful algal blooms, including red tides. Habitat degradation and loss, nutrient pollution in runoff from developed landscapes (urban, residential, and agricultural), and other factors may stimulate and worsen HABs.

Florida red tides are known to:

- Produce a toxin (brevetoxin) that can: 1) make people sick; 2) kill fishes, shellfishes, marine mammals, and birds; and 3) make shellfish unsafe to eat.
- Create low-oxygen "dead zones" that worsen already adverse conditions; and
- Hurt local economies through lost commerce, recreation, and tourism.



What is being done to combat harmful algal blooms, including red tides, in Florida and throughout the nation through NEPs?

When we invest in America's estuaries through the National Estuary Programs, we get cleaner water and thus minimize nutrient pollution that can worsen the frequency, duration, and extent of red tides and other harmful algal blooms in the future. These investments include:

1. **Reducing nutrient pollution entering our waters from all sources**: runoff from urban, suburban, and agricultural landscapes, point-source discharges; & atmospheric deposition on land & water (*i.e.*, air pollution that falls, often in rain, snow, and dusts).
2. **Conserving and creating natural coastal habitats** like oyster reefs, mangroves, marshes, and freshwater wetlands that remove nutrient pollution and provide other valuable ecosystem services.
3. **Engineering stormwater facilities that mimic the ecosystem services provided by natural habitats** to remove nutrient pollution from runoff before it can reach our coastal waters.

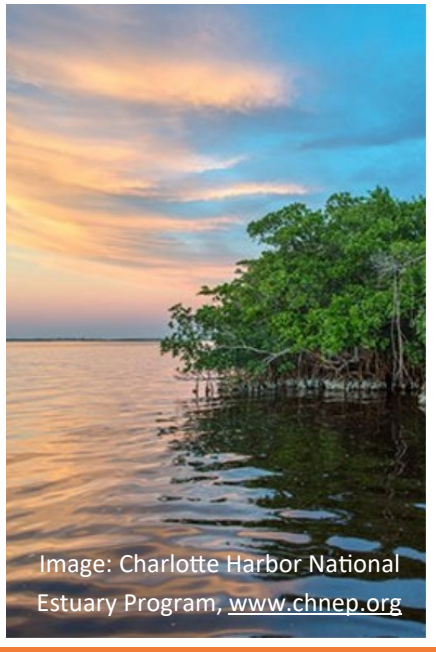


Image: Charlotte Harbor National Estuary Program, www.chnep.org

To learn how the Association of National Estuary Programs assists these efforts, visit nationalestuaries.org.

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Where can I find reliable sources of information about Florida red tide and other harmful algal blooms?

Status updates (Florida Fish & Wildlife Conservation Commission): http://www.myfwc.com/research/redtide/statewide/

Shoreline and Beach observations (Mote Marine Lab): http://www.visitbeaches.org/

Forecasting tools: NOAA, https://tidesandcurrents.noaa.gov/hab/gomx.html; USF Collaboration for Prediction of Red Tides, http://cprweb.marine.usf.edu/

Human health concerns (Florida Department of Health): http://www.floridahealth.gov/environmental-health/aquatic-toxins/index.html

Additional background information:

Gulf of Mexico Alliance: A Primer on Gulf of Mexico HABs. http://myfwc.com/media/2668161/habprimer.pdf

US Environmental Protection Agency: What is nutrient pollution? https://www.epa.gov/nutrientpollution/infographic-what-nutrient-pollution

Mote Marine Lab: Florida Red Tide FAQs https://mote.org/news/florida-red-tide

Additional scholarly articles:

Brand, L.E. and A. Compton. 2007. Long-term increase in *Karenia brevis* abundance along the Southwest Florida Coast. Harmful Algae 6:232–252.

Dixon, L.K, P.J. Murphy, N.M. Becker, and C.M. Charniga. 2014. The potential role of benthic nutrient flux in sup-port of Karenia blooms in west Florida (USA) estuaries and the nearshore Gulf of Mexico. Harmful Algae 38:30–39.

Heil, C.A., L.K. Dixon, E. Hall, M. Garrett, J.M. Lenes, J.M O'Neil, B.M. Walsh, D.A. Bronk, L. Killberg-Thoreson, G.L. Hitchcock, K.A. Meyer, M.R. Mulholland, L. Procise, G.J. Kirkpatrick, J.J. Walsh, and R.W. Weisberg. 2014. Blooms of *Karenia brevis* (Davis) G. Hansen & Ø. Moestrup on the west Florida shelf: nutrient sources and potential management strategies based on a multi-year regional study. Harmful Algae 38:127–140.

Glibert, P.M., J.M. Burkholder, T.M. Kana1, J. Alexander, H. Skelton, and C. Shilling. 2009. Grazing by *Karenia brevis* on *Synechococcus* enhances its growth rate and may help to sustain blooms. Aquatic Microbial Ecology 55:17–30.

James, K.J., B. Carey, J. O'Halloran, F.N.A.M. Van Pelt and Z. Škrabáková. 2010. Shellfish toxicity: human health implications of marine algal toxins. Epidemiology and Infection 138:927-940.

Kimm-Brinson, K.L. and J.S. Ramsdel. 2001. The red tide toxin, brevetoxin, induces embryo toxicity and developmental abnormalities. Environmental Health Perspectives 109:377–381.

van Deventer, M., K. Atwood, G.A. Vargo, L.J. Flewelling, J.H. Landsberg, J.P. Naar, and D. Stanek. 2011. Karenia brevis red tides and brevetoxin-contaminated fish: a high risk factor for Florida's scavenging shorebirds? Botanica Marina 55:31-38.

To get involved with the National Estuary Program in your state to help reduce nutrient pollution and protect your community and its economy, visit nationalestuaries.org.