

FWC/FWRI is tasked by the state with monitoring HABs in state waters, including red tide. This is accomplished via maintenance of a HAB volunteer sampling network (consisting of FWC agency and FWRI staff, volunteers, subcontractors (Mote, FSU, FGCU, other state, county and local agencies) to provide water samples for HAB microscopic counts, provision of *Karenia* monitoring data and shellfish mouse bioassay data to the Florida Department of Agriculture and Consumer Science (FDACS), event response investigations of suspected HAB related impacts and a HAB research program covering a variety of topics including new technology development and integration.

Products include:

- 1) Weekly Friday bulletin of red tide locations (NW, SE, E coasts) consisting of maps and data summaries
- 2) Weekly Tuesday web update
- 3) State HAB Status hotline
- 4) HAB historical database
- 5) Count data provided to NOAA for Gulf HAB bulletin
- 6) Count data provided to FDACS for regulation of commercial shellfish beds

To supplement the state monitoring data, the following are under development:

USF

- 1) USF has developed a cloud free satellite SST product for SEACOSS domain.
- 2) USF has developed a cloud-free satellite chlorophyll *a* product for SECOOS domain

USF/FWC

- 1) USF/FWC have a fleet of Bottom Station Ocean Profilers (BSOPs) continuously deployed off the WFS (http://ocgweb.marine.usf.edu/BSOP/bsop_index.shtml)
- 2) FWC funded 3 Wetlab fluorometers for incorporation into Bottom Stationed Ocean Profiler System (BSOPS)
- 3) USF/FWC have developed particle trajectory model originating from FWC- *K.brevis* cell counts (www.ocgmod1.marine.usf.edu/WFS/Plot_HAB.html)
- 4) CPRT: A joint FWC/USF project to establish a Center for the Prediction of Red Tides (CPRT) to utilize FWC monitoring data in conjunction with physical and eventually coupled biophysical model results to provide weekly forecasts of projected red tide movements and impacts.
- 5) USF/FWC currently have available a fully automated nested circulation model running in a daily nowcast/forecast model (<http://ocgmod1.marine.usf.edu/WFS/>)
- 6) USF/FWC have begun routine drifter deployment for nearshore tracking of HAB's in 2006-07. (www.ocgweb.marine.usf.edu/drifter/SURF_DRIFT.shtml)

FWC/USF/Mote

- 1) NOAA funded MERHAB grant (2002-2007) for development and application of *Karenia* detection technology, FWC, USF and Mote have further developed the brevbuster, molecular probes for *Karenia*, BSOPs samplers and the Comps buoy array. Brevbuster, probes and HPLC have been tested in 9 research cruises against each other.

Development of all three methods and application to in situ deployments are ongoing, along with incorporation into the current state monitoring program.

2) Through ECOHAB and MERHAB, NOAA-funded investigators are conducting research on the detection, causes, and dynamics of HABs, forecasting growth, transport, and toxicity, and transfer new technologies to enhance Gulf of Mexico HAB monitoring and forecasting programs. ECOHAB and MERHAB research projects will predict and ameliorate HAB impacts on higher trophic levels and humans.

FWC

1) FWC benchtop based groundtruthing of molecular probes for 4 *Karenia* species (*K. brevis*, *K. mikimotoi*, *K. selliformis*, *K. papilionacea*) vs. microscopic counts for *Karenia* species has been integrated into the state monitoring program in 2006.

2) Ongoing discussions with Chris Scholin (MBARI) for potential ESP test deployment in central west Florida with *Karenia* molecular probes

FWC/USACE/NOAA

1) FWC/USACE/NOAA have funded the construction and maintenance of 3 MARVIN in situ water quality monitoring platforms allowing moveable long-term water quality monitoring using a large cadre of sensors and analyzers with testing of additional instrumentation specific to HAB's (Phytoflash, CDOM fluorometer, UV nitrate sensor, nutrient analyzers)

FWC/UMD

1) FWC/UMD funded project to construct and install autonomous urea analyzers on 2 of 3 MARVIN water quality monitoring platforms

2) FWC has funded the transmission of the MARVIN data to the USFComps and SECOORA data systems for archiving and near-realtime access via website by the public and interested managers.

FWC/UF

1) FWC/UF – ongoing collaboration on the development of statistically based recommendations for statistically sound integration of new HAB technology into existing monitoring programs.

FWC/FSU

1) FWC/FSU have expanded monitoring of *Karenia* species and currents coupling physical and biological monitoring in the Big Bend and Panhandle region of Florida (K tower transect), in conjunction with Coast Guard Auxiliary sampling program.

FWC/UNCW/TX

1) FWC/UNCW/TX have completed a laboratory based pilot study of the 'lab on a chip', which can be adapted for remote *in situ* brevetoxin detection.

FWC/Mote

1) Ongoing brevbuster development and SoCOOL support as part of the FWC/Mote Collaborative Red Tide Program.

The optically-based detection network for the Florida red tide (Gary Kirkpatrick)

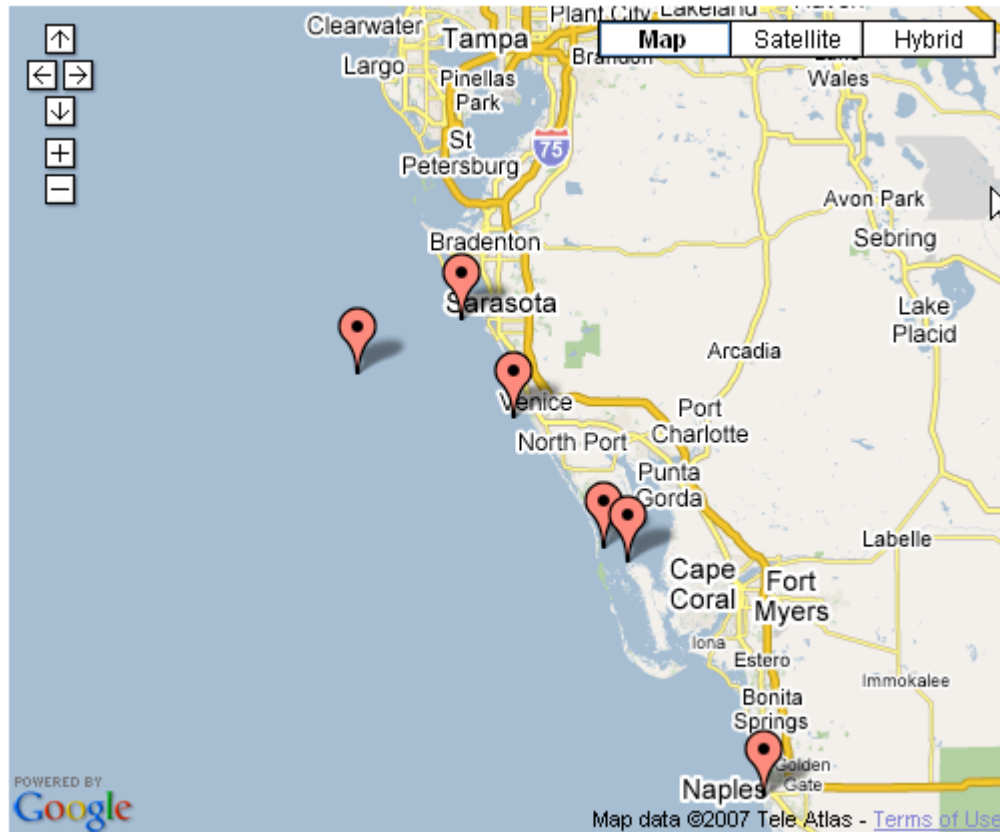
1. The first prototype of the optical phytoplankton discriminator (BreveBuster) went to sea in August 1997 in an attempt to automate the discrimination of *Karenia brevis* in mixed natural phytoplankton communities (Kirkpatrick et al., 2000).
2. A more portable prototype was prepared for use on the regularly scheduled 'ECOHAB: Florida' cruises and regular monitoring surveys conducted for the Florida Fish and Wildlife Conservation Commission/Fish and Wildlife Research Institute.
 - a. During those cruises and two deployments at LEO-15, off the coast of New Jersey, the BreveBuster demonstrated an additionally capability for making measurements of colored dissolved organic material (Kirkpatrick et al., 2003; Schofield et al., 2006).
3. Laboratory work to extend the applicability of the method to other classes of microalgae continued while the prototype was being tested at sea (Millie et al., 2002).
4. In April 2002 the National Science Foundation awarded a grant to repackage the BreveBuster as payloads for a Slocum Glider (Webb Research Corporation) and a REMUS (Hydroid, LLC) autonomous underwater vehicle (AUV).
5. A NOAA/ECOHAB project supported the application of the BreveBuster-equipped AUVs to nested, adaptive 3-D mapping of the Florida red tide from September 2002 to December 2004 (Robbins et al., 2006).
6. A project designed to test the long-term field deployment capability of the BreveBuster and conduct comparisons between a molecular probe detection technique and the BreveBuster was begun in October 2002 and continues now supported by NOAA/MERHAB.
 - a. Under the MERHAB project the first Brevebuster was deployed on USF/COMPS buoy 10 in June 2004.
 - b. Additionally, the MERHAB project supported the integration of the BreveBuater into the USF Bottom-Stationed Ocean Profiler (BSOP).
7. The National Sea Grant Program supported a project from June 2003 to December 2005 in which the Florida Department of Agriculture/Division of Aquaculture and Mote Marine Laboratory deployed three fixed installations of BreveBusters near shellfish farming operations in Charlotte Harbor.
8. We are in the third year of a NOAA/NOS IOOS supported project that is integrating the BreveBuster into the NOAA NWLON and C-MAN network to provide continuous *Karenia* detection at two sites for the HAB Bulletin analysts.
9. This project has also incorporated two Slocum Gliders equipped with BreveBusters to provide mobile subsurface detection of *Karenia* in support of satellite remote sensing for the HAB Bulletin.
10. The State of Florida through the FWCC/FWRI is supporting the deployment of a network of BreveBusters on small buoys, channel markers and the FWRI

MARVIN, environmental sampling platform, along the central, west coast of Florida from Tampa Bay to Marco Island.

11. Most recently, the EPA GOMP through the GOMA is supporting the installation of C-MAN stations equipped with BreveBusters in the Gulf of Mexico off the coast of Vera Cruz, Mexico.

The BreveBuster was represented at the HABSOS workshop in 2000, the ACT HAB workshop in March 2002, the HABSOS-GCOOS workshop in April 2004, and the Bio-Sensing Workshop in 2007. Additionally it has been report at numerous national and international science meetings.

Data are relayed from deployed BreveBusters via VHF radio or satellite phone depending on distance from shore. Typically the fixed installations report on either a one or two hour period. The gliders and BSOP surface less frequently (typically two to six hours) for position fixes and data telemetry. Data are received at several locations depending on the deployment platform. The BSOP reports to USF, the NWLON site at the Naples Pier reports to NOAA/CO-OPS and the rest of the deployed instruments report to the Sarasota Operations of the Coastal Ocean Observation Laboratories (SO COOL) located at Mote Marine Laboratory. Data reported to the SO COOL are presented in near real time in graphic form for the fixed installations and distribution maps on Google Earth for the gliders. By the end of 2007 there will be approximately 22 BreveBuster in operation or in the process of being integrated into existing data acquisition networks. This includes three Slocum gliders, one REMUS, one BSOP, two COMPS buoys, one MARVIN, three dedicated mobile buoys, two piers, one dock and five other fixed platforms. Several spares are maintained to provide regular service rotation.

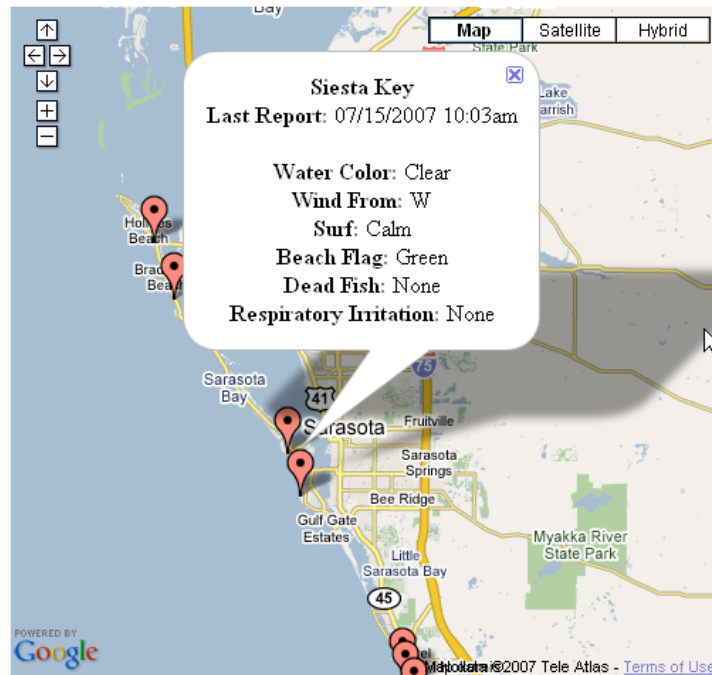


Locations of fixed sites where BreveBuster are or have been deployed.

The Beach Conditions Reporting System (Barbara Kirkpatrick)

1. Recent research has shown a measurable difference in asthmatics after a 1 hour beach exposure to Florida red tide aerosols. These findings demonstrate a need to inform beach goers of the conditions on the beach prior to arrival at the beach to minimize exposure from toxins.
2. Additionally, during the bloom of 2005, the most frequent question the general public asked when calling Mote Marine Lab, on a daily basis, was “which beach was least impacted by red tide.”
3. In June 2005, the Florida Department of Health funded a pilot project to implement a near real time beach conditions reporting system. The project provided personal data assistants (PDAs) to lifeguards on Sarasota Counties 6 public beaches to provide twice daily current conditions reports. The system went live Labor Day weekend, 2006.
4. Through START (Solutions to Avoid Red Tide) funds were provided by Manatee County to add their 2 public beaches to the system. The 2 sites were added in January 2007.
5. At a red tide workshop sponsored by Rookery Bay in January 2007, stakeholders identified the Beach Conditions Systems as a method to assist their community in

- lessening the impacts of red tide. A grant was applied for in May 2007 to add 10 sites in Collier County to the System and is pending award announcement.
6. Again through START, Lee County and Pinellas County are also asking for expansion of the system to their community. Plans to implement in those counties are underway.
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Links to Red Tide Cell Count/Bloom status reports:

www.mote.org

www.ourgulfenvironment.net

Locations of Beach Conditions Report stations.