Monitoring and Forecasting on other coasts

Common Problem to all Areas:

Advance warning of HABs to limit economic and public health impacts

Objective:

Forecasts (today, tomorrow, and this year)

Solutions:

<u>Monitoring</u>:

- nowcasting (we don't want to know tomorrow that we should have done something today)
- initializing forecast models
- validating models

<u>Modelling (heuristic and numerical)</u>

<u>Public Awareness and education</u>

Conclusion: To succeed with a Nowcast /Forecast: work backwards

Start small: pick one or two manager needs

the strategy can be for a cruise ship, but start with a skiff; e.g. where do we think a bloom is today

Don't confuse research interests with management needs

a GIS web site with all the data is really interesting, but . . .

Get toxin/cell counts into some common type

(Low, Medium, High, 10's of ug's, whatever)

First figure out the basic heuristic model, then decide on the other models and other observations (a 3-D NPZ model is really interesting, but ...)

Analysis is necessary, always; and a common standard for analysis is more necessary. Obs are subject to interpretation.

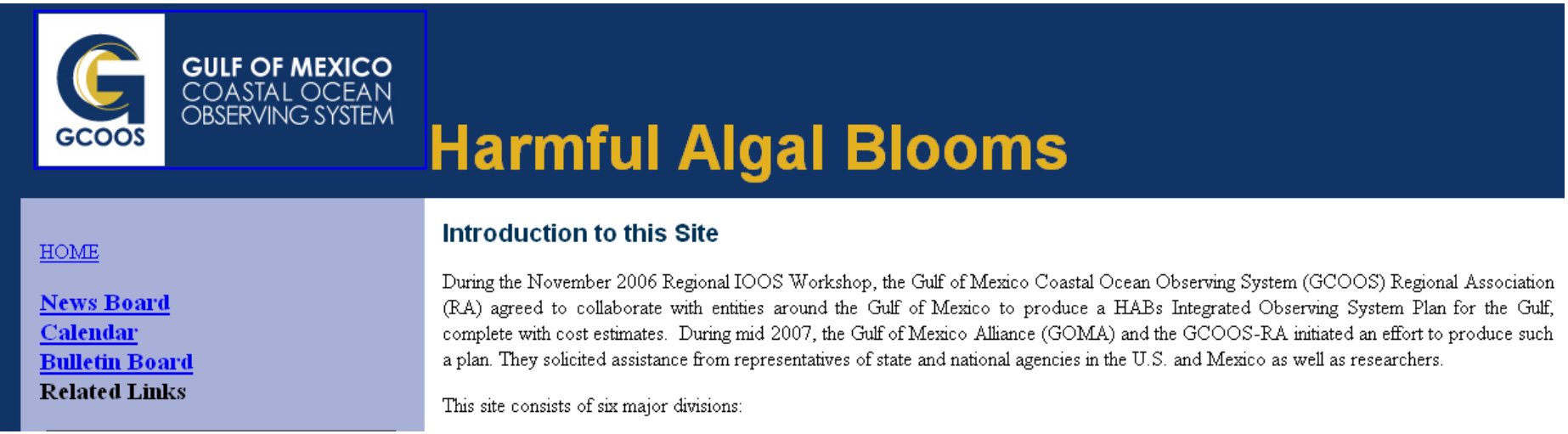
GCOOS, Concept HAB system (gcoos.tamu.edu) Drafted last year with active involvement of users.

Harmful Algal Blooms Integrated Observing System (HABIOS)

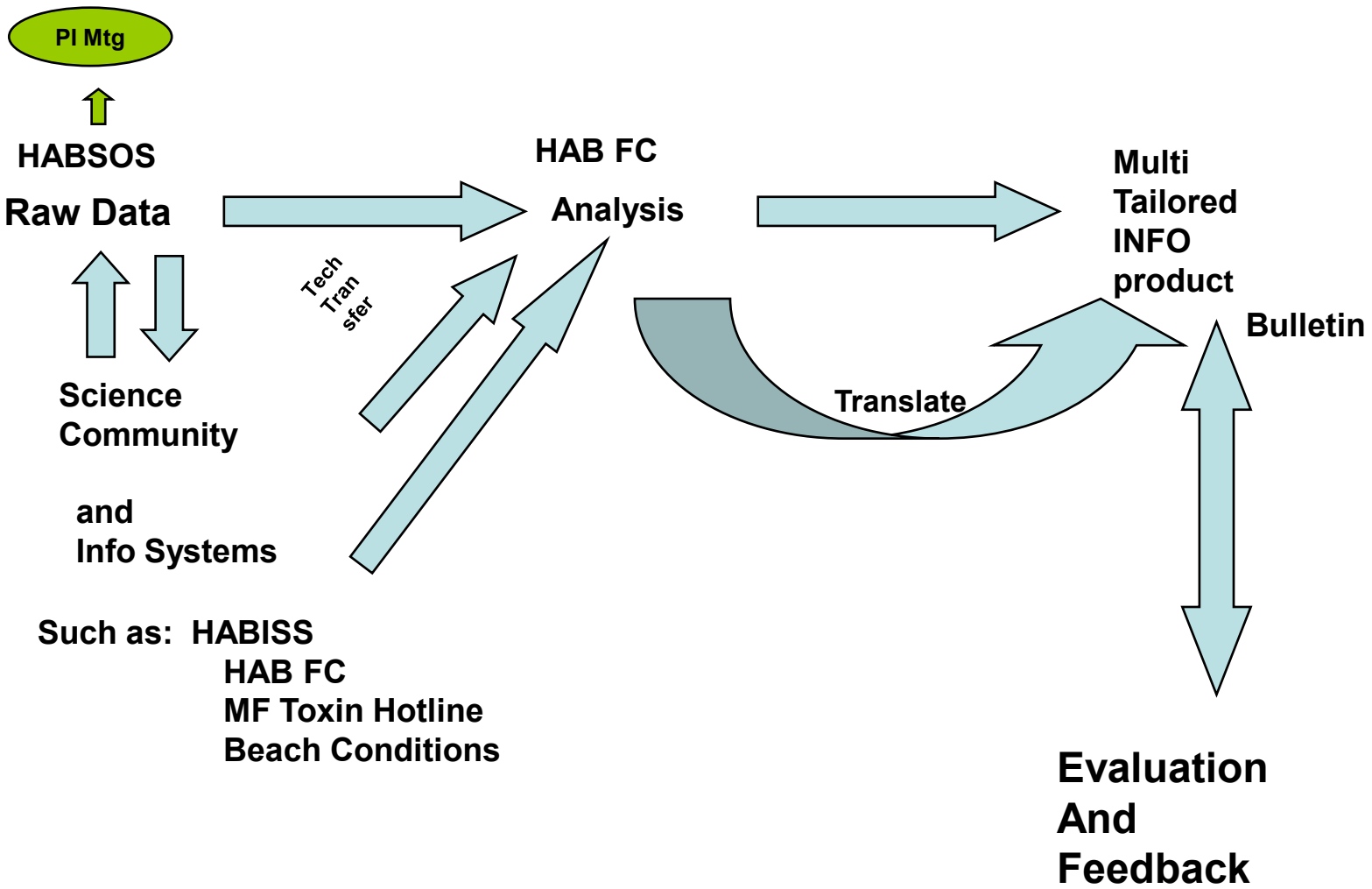
1.0 Vision Statement

The vision statement for the Harmful Algal Blooms Integrated Observing System for the Gulf of Mexico is:

To establish a sustained observing system as part of the U.S. IOOS that will facilitate and enhance efforts to manage and reduce detrimental effects of harmful algal blooms (HABs) on human health and living marine resources (non-human animals and plants) and to mitigate socioeconomic impacts of HABs on coastal communities.



GCOOS concept, gcoos.tamu.org



What are Forecasts?

- ***Nowcast***: There is a HAB, ***where*** is it today?
  - This is usually where it was yesterday. A location (monitoring) and a transport (modeling) problem

- ***Forecast***: There is a HAB, ***where*** will it be in the next few days?
  - A location (monitoring) and a transport modeling problem

- ***Prediction:***
  - What kind of HAB
  - When and Where will HAB initiate or dissipate?
    - Will the HAB still be here next month?
  - How severe?
    - No HAB today, but HAB next week/month?
  - These are ecological modeling problems

Forecasting and Monitoring

Some philosophical points:

Forecasts need to be operational, if they are sought for the long-term.

Monitoring can include non-operational sampling; but the collation and evaluation of data must be operational.

“What is Operational?”

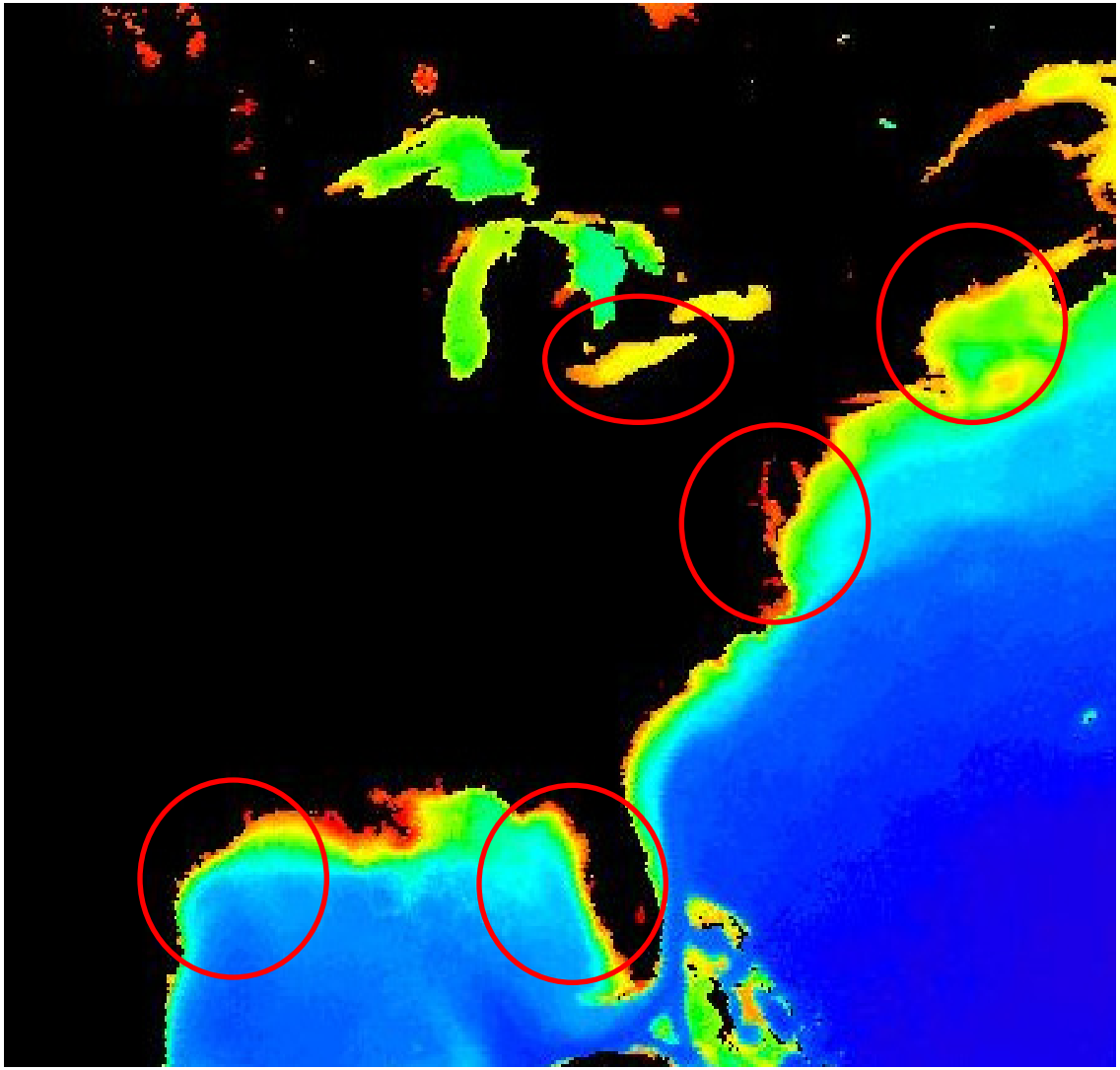
What is Operational?

- **Produced on a determined schedule with accountability**.
- **Reliable (redundancy, backup, operates during vacations, holidays, workshops)**
- **Institutionally supported**
  - (institutions don't usually retire, move, or change fields).
  - Implies stable funding and personnel mgmt, not grant funded.

*A sample collected most Tuesdays, or a model set up to run every morning is **routine** but not necessarily operational.*

Example areas within US with HAB monitoring/forecast systems

West coast is described at this meeting



Around the country, a summary of monitoring

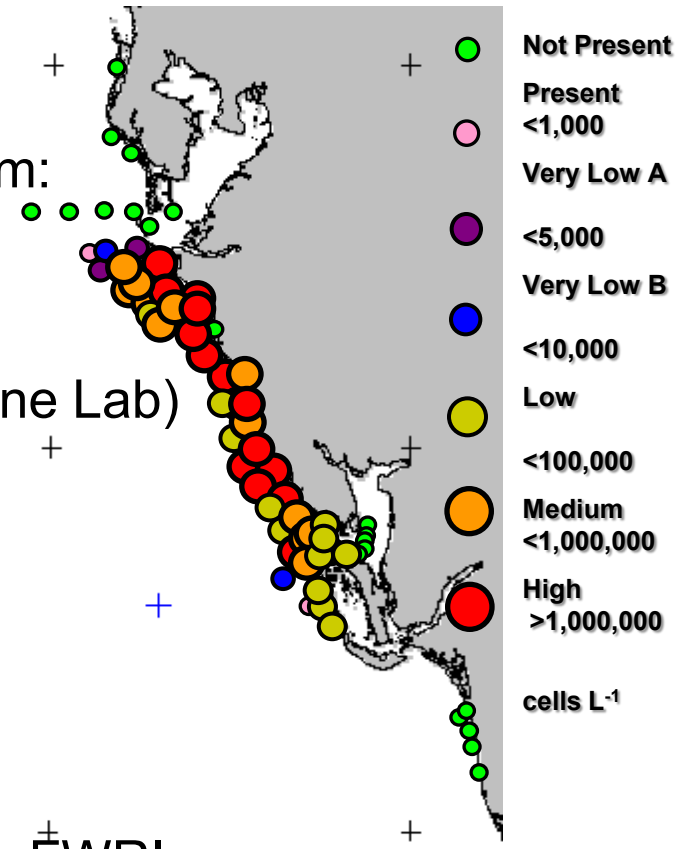
Region	Monitoring	forecasting
Texas	TexHAB (state integrated): Parks, Health, PhytoMN, research, cell counts, experimental sensors	Demonstration from NOAA GMex (NOAA & TGLO circulation, satellite and TexHAB data)
LA-MS-AL	Shellfish safety	
Florida	State funded coordination (FWRI etc.; more later	Operational (NOAA)
Southeast	Shellfish safety	
MD	MdDNR HAB program (esp. cyano, also icthyotoxic)	Experimental probablistic (using Bay circulation model)
DE	State and PhytoMN	
NJ /NY	Brown algae, chl-a, overflights	
MA-NH-ME	Informal coordination toxin & cell, state & research	Experimental seasonal & NRT
OH/MI	cyano (esp. for water supply)	Lake Erie demonstration

State of Florida: Example monitoring program with operational mgmt

Florida Monitoring Program for *Karenia brevis*

FWRI oversight; samples & data from:

- FWRI
- Fl DOACS (closes shellfish)
- private (state-funded) (Mote Marine Lab)
- university
- county environmental
- county health
- volunteers (charter boat)



Assembled cell counts distributed by FWRI

- weekly web site

Education and public health coordination

Some specifics on public health

How these Issues are being addressed in Florida

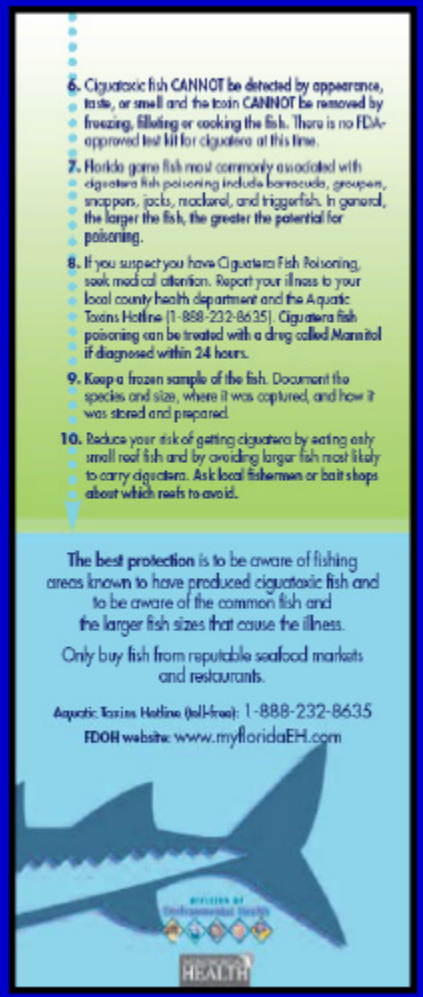
- FDOH Aquatic Toxins Coordinator
  Surveillance / Outreach / Response / Research

- Creation of a Aquatic Toxins Hotline (888-232-8635)
  Three way resource for information:
  - Citizen Education Outreach
  - Health Care / Medical Information and Consultation
  - Research Data on Reported Cases

- Development of Outreach Materials in variety of formats
  Involve many essential collaborators

Example of outreach

Non- Technical Brochure on Ciguatera



NOAA Operational Forecast System
Gulf of Mexico, Demonstration since Sep 1999;
Operational since Sep 2004:

An Operational *forecast* of impact: 0-3 days
and a *prediction* of likelihood of a bloom for mgmt

Gulf of Mexico Harmful Algal Bloom Bulletin
6 January 2005
National Ocean Service
National Environmental Satellite, Data, and Information Service
Last bulletin: January 3, 2005

Conditions: A harmful algal bloom has been identified north of the lower Keys. Water discoloration and slight to some risk of fish kills in the lower Keys is possible over the weekend. A non-harmful algal bloom has been identified alongshore near Clearwater and offshore from Clearwater to Sarasota. Reports of discolored water are possible in this region.

Analysis: The harmful algal bloom identified north of the lower Keys persists, but continues to dissipate. Little to no change in extent or movement has occurred over the last few days. The bloom was earlier identified as a combination of K. brevis and Rhizosolenia; current K. brevis levels are presently unknown. Chlorophyll concentrations average 2-3μg/L throughout the eastern offshore portion of the bloom. Southwest of Cape Sable, at 81°26W, 25°04N, chlorophyll tops out at approximately 9μg/L with neighboring chlorophyll levels averaging 4-6μg/L. Chlorophyll concentration up to 13μg/L in the eastern lower Keys at 81°17W, 24°47N); surrounding area averages 4-6μg/L. Cloudy conditions over the lower Keys inhibits a clear view of whether the bloom has migrated through the Keys to the Atlantic Ocean. Little movement and/or intensification of the bloom expected through Sunday.

Reports of discolored water are possible alongshore near Clearwater and offshore from Clearwater to Sarasota due to an identified non-harmful algal bloom.

-Fisher, Bronder

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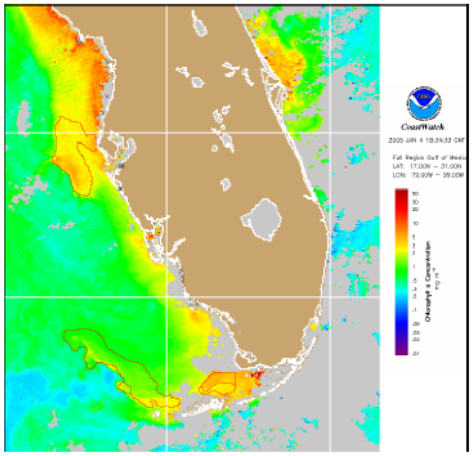

Chlorophyll concentration from satellite with possible HAB areas shown by red polygo
tion sampling data from December 31, 2005 shown as red squares (high), red triangles
monds (low b), red circles (low a), orange circles (very low b), yellow circles (very low
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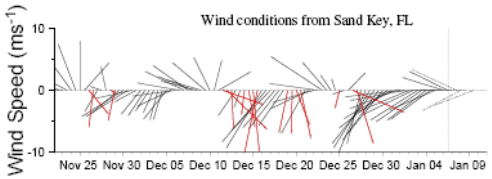


Wind speed and direction are averaged over 12 hours from measurements made on buoys. Length of line indicates speed; angle indicates direction. Red indicates that the wind direction favors upwelling near the coast. Values to the left of the dotted vertical line are measured values; values to the right are forecasts.

Winds (5-10 knots, 2-5 m/s) today through Saturday expected to vary between easterly becoming northeasterly on Sunday.

Harmful Algal Bloom Forecasting System

ation on HAB detection and forecasting in the Gulf of Mexico

ses the options for
rovided by NOAA supplies
lopment or movement of

observations, and buoy data

Conditions Report

Monday, July 11, 2005

A harmful algal bloom has been identified from northern Pinellas to northern Lee County. Patchy very low to high impacts possible in Pinellas and northern Sarasota Counties every afternoon through Thursday. Patchy very low to moderate impacts are possible in southern

http://www.csc.noaa.gov/crs/habf

Florida Operational System

1999: Started with request from Karen Steidinger, FWRI, for **interpreted satellite imagery** to support monitoring program

August: Cell counts provided to NOAA

September: Imagery incorporated into NOAA CoastWatch, interpreted imagery provided to Florida

2000: Upwelling heuristic model added, first prediction

2001: Transport model included (1-D wind-driven), format converted to PDF (HAB Bulletin), **manager request (including priority in email subject)**

Cell counts included with imagery

2002: New satellite algorithm incorporated

2004: Operational, all rules quantified, passed from research to operations

2006: Structured Skill Assessment

2008: test of improved upwelling model (IOOS involvement)

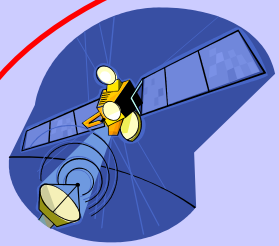
2009: tests of new circulation model for transport (IOOS)

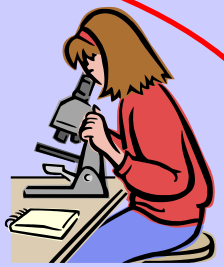
Toxin/Impact/Cell Counts: Data sources critical to identifying a HAB field for forecasts

Data Type	Source	Format
Cell Counts (FL, AL, MS)	Direct, also FWRI database	Manual, Excel, PDF (parsed), DBF
Cell Counts (TX)	TexHAB (integrated by TPWD)	Manual, Excel
Alerts/Warnings of Problems	Direct	Email lists and direct email
Respiratory Impact Data (Lifeguard program)	Mote Marine Lab	CSV, ftp/email (automated process)
AUV detection	Mote Marine	ftp of csv (automated process)
Poison Hotline	U.Miami	Automated ftp

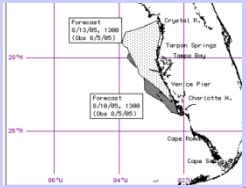
For Forecast (or many ecological) models, observations need to be interpreted for assimilation

sensors





Remote sensing



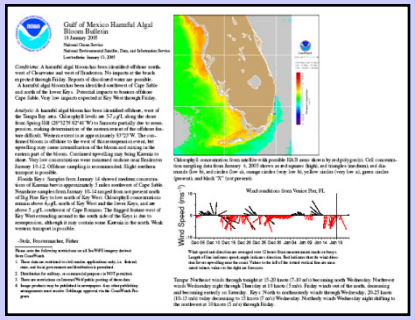
In situ samples

Regional support needed for existing and improved observations & models

Analysts

Synthesis of Data and Models through Analysis

HAB Bulletin



Assessment for Forecasts

Information to Managers

Management Actions

Models: Rule-based

- Need to establish rules for development of a bloom
  - Timing of blooms (seasonality)
  - Location of blooms (identify hot spots, areas where blooms do not occur)

- Once established at the coast, a series of rules must be developed for:
  - Transport: where is bloom going
  - Extent: will bloom expand its region of impact
  - Intensification: will bloom get bigger (higher cell counts/larger area)
  - Impact: what conditions will beaches experience, e.g., fish kills, respiratory irritation

Synthesis and analysis: Development of a forecast

Page 1

Gulf of Mexico Harmful Algal Bloom Bulletin
21 September 2004
National Ocean Service/NCCOS and CSC
NESDIS/CoastWatch and NDBC
Last bulletin: September 17, 2004

Analysis
HAB Forecast:

D

No harmful algal blooms have been found along Florida's coast. Recent tropical storms have caused sediment resuspension and non-harmful blooms, which may cause discolored water.

Analysis:

C

Samples taken last week from southwest Florida near Sarasota, Fort Meyers, and Naples showed no Karenia brevis. Imagery shows elevated chlorophyll along much of Florida's west coast: concentrations over 4 micrograms per liter off Cape San Blas and Cedar Key; over 5 micrograms per liter near Clearwater, Sarasota, Naples; and over 7 micrograms per liter Everglades City.

Winds have favored upwelling in southwest Florida for several days and are forecasted to continue for the rest of the week and through the weekend. These conditions are conducive to HAB formation, so this area should be monitored. Sampling here is recommended. Conditions in the panhandle don't favor HAB formation.

Bronder, Stolz

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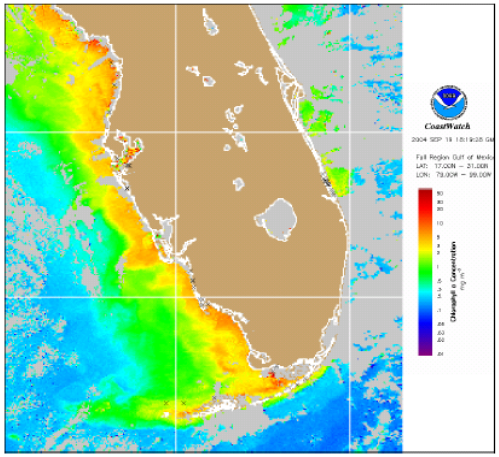
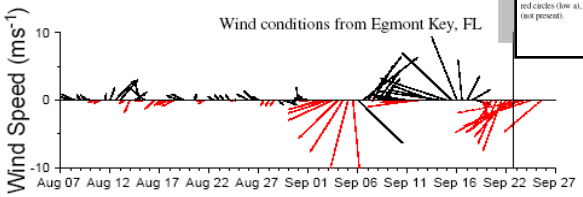


Chlorophyll concentration from satellite with possible HAB areas shown by re tion sampling data from September 12, 2004 shown as red squares (high), red monds (low b), red circles (low a), orange circles (very low b), yellow circles ((present), and black "X" (not present).

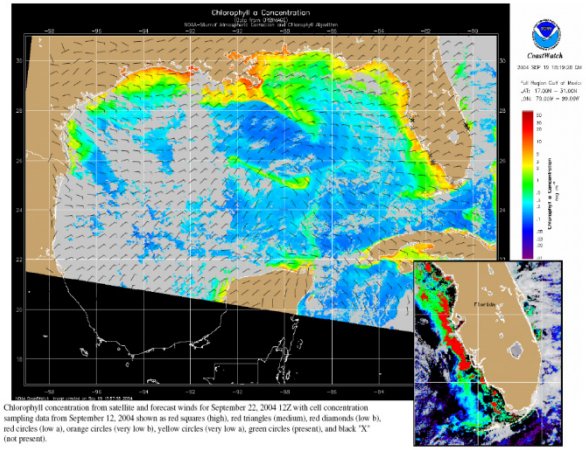


B

Wind speed and direction are averaged over 12 hours from measurements made on buoys. Length of line indicates speed; angle indicates direction. Red indicates that the wind direction favors upwelling near the coast. Values to the left of the dotted vertical line are measured values; values to the right are forecasts.

Southwest Florida: Winds have been northeasterly for the past few days, and are forecasted to shift to easterly then northeasterly over the next couple of days. The NWS Marine Forecast calls for easterly winds until Thursday, then northeasterly winds over the weekend. Florida Panhandle: Winds have been northeasterly for the past few days, and are forecasted to become easterly for the next couple of days.

Page 2



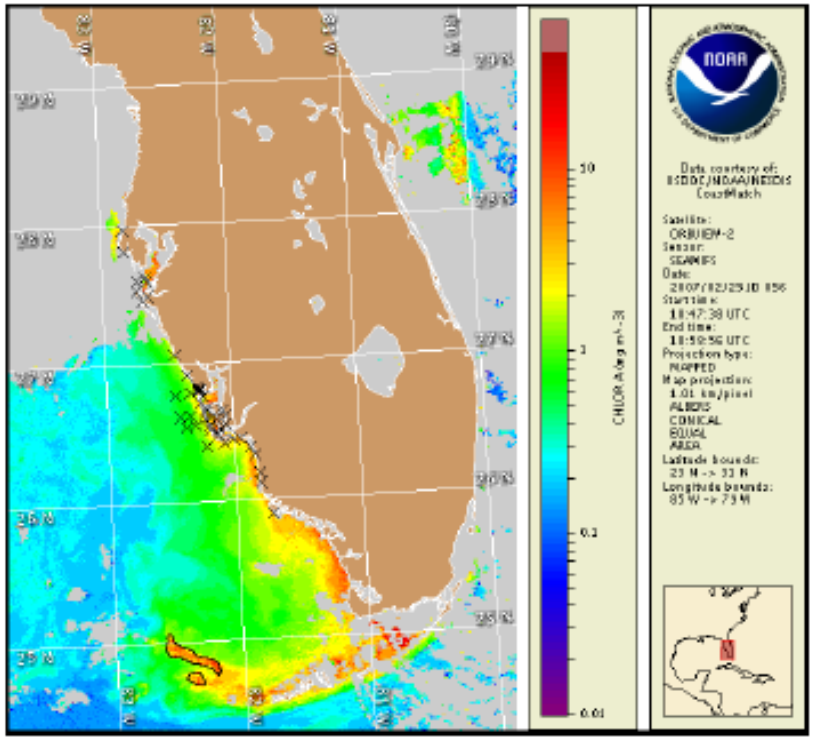
Chlorophyll concentration from satellite and forecast winds for September 22, 2004 12Z with cell concentration sampling data from September 12, 2004 shown as red squares (high), red triangles (medium), red diamonds (low b), red circles (low a), orange circles (very low b), yellow circles (very low a), green circles (present), and black "X" (not present).

Blooms shown in red (see p. 1 analysis and image for interpretation)

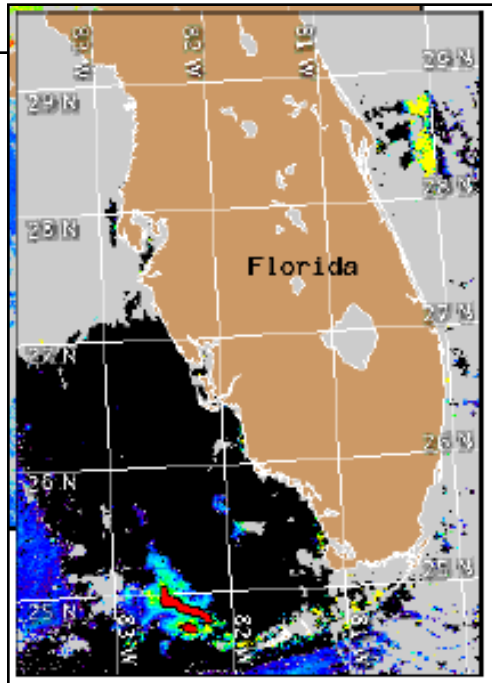
Sent as PDF

A. Image Analysis

Bloom location and extent determined by ocean color data and cell counts

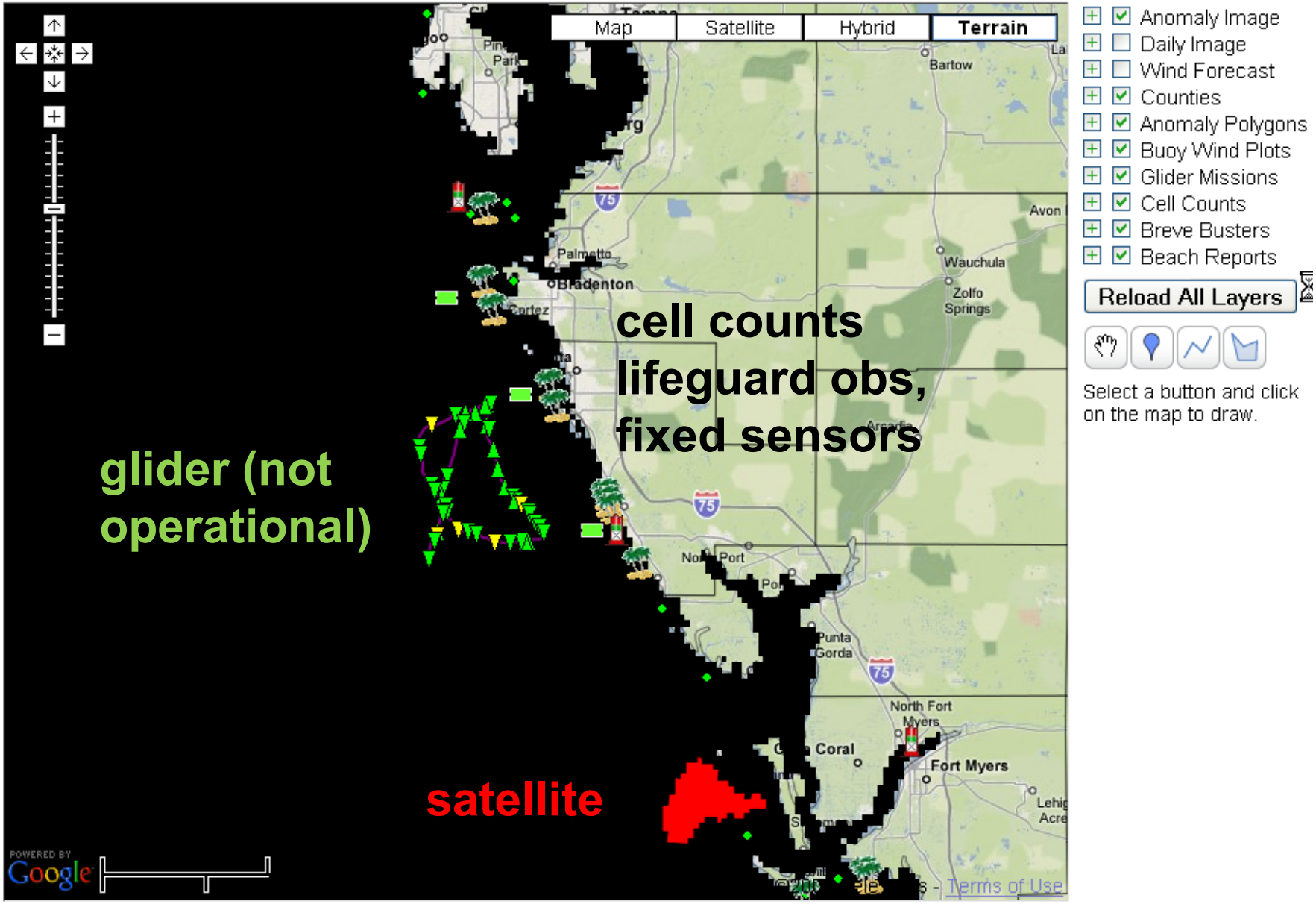


Satellite chlorophyll image with possible HAB areas shown by red polygon(s).Cell concentration sampling data from February 16-22 shown as red squares (high), red triangles (medium), red diamonds (low b), red circles (low a), orange circles (very low b), yellow circles (very low a), green circles (present), and black "X" (not present). For a list of cell count data providers and a key to the cell concentration categories, please see the the HABFS bulletin guide: http://www.csc.noaa/gov/crs/habf/habfs_bulletin_guide.pdf



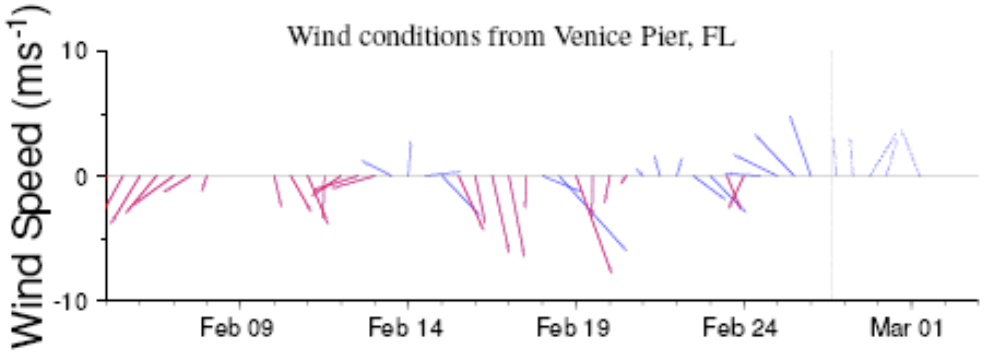
Verified HAB areas shown in red. Other bloom areas shown in yellow (see p. 1 analysis for interpretation).

Assimilation strategy is rule-based for analysts



B. Wind Analysis

Analysis of NDBC winds, with NAM forecasted winds and Marine Weather Forecast for the next 3-4 days. Analysis is also used in to forecast transport, intensification and impact.



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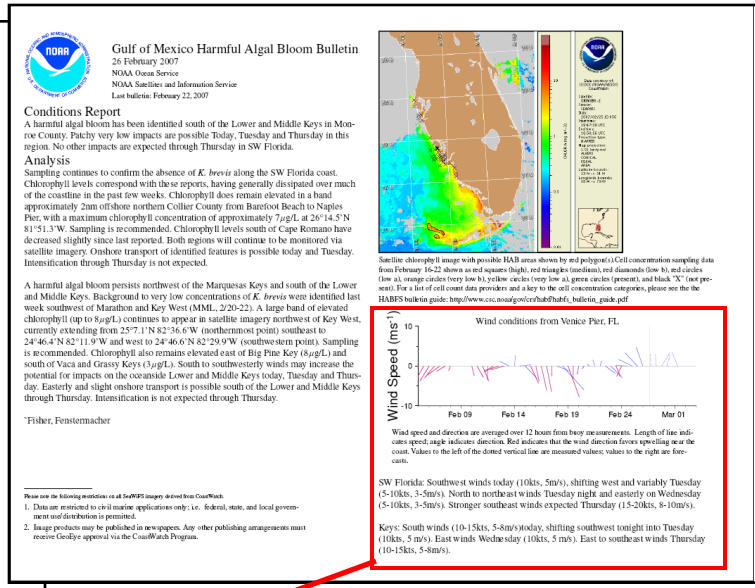
SW Florida: Southwest winds today (10kts, 5m/s), shifting west and variably Tuesday (5-10kts, 3-5m/s). North to northeast winds Tuesday night and easterly on Wednesday (5-10kts, 3-5m/s). Stronger southeast winds expected Thursday (15-20kts, 8-10m/s).

Keys: South winds (10-15kts, 5-8m/s)today, shifting southwest tonight into Tuesday (10kts, 5 m/s). East winds Wednesday (10kts, 5 m/s). East to southeast winds Thursday (10-15kts, 5-8m/s).



Gulf of Mexico Harmful Algal Bloom Bulletin
26 February 2007
NOAA Ocean Service
NOAA Satellites and Information Service
Last bulletin: February 22, 2007

Conditions Report

A harmful algal bloom has been identified south of the Lower and Middle Keys in Monroe County. Patchy very low impacts are possible Today, Tuesday and Thursday in this region. No other impacts are expected through Thursday in SW Florida.

Analysis

Sampling continues to confirm the absence of *K. brevis* along the SW Florida coast. Chlorophyll levels correspond with these reports, having generally dissipated over much of the coastline in the past few weeks. Chlorophyll does remain elevated in a band approximately 2nm offshore northern Collier County from Barefoot Beach to Naples Pier, with a maximum chlorophyll concentration of approximately 7μg/L at 26°14.5'N 81°51.3'W. Sampling is recommended. Chlorophyll levels south of Cape Romano have decreased slightly since last reported. Both regions will continue to be monitored via satellite imagery. Onshore transport of identified features is possible today and Tuesday. Intensification through Thursday is not expected.

A harmful algal bloom persists northwest of the Marquesas Keys and south of the Lower and Middle Keys. Background to very low concentrations of *K. brevis* were identified last week southwest of Marathon and Key West (MML, 2/20-22). A large band of elevated chlorophyll (up to 8μg/L) continues to appear in satellite imagery northwest of Key West, currently extending from 25°7.1'N 82°36.6'W (northernmost point) southeast to 24°46.4'N 82°11.9'W and west to 24°46.6'N 82°29.9'W (southwestern point). Sampling is recommended. Chlorophyll also remains elevated east of Big Pine Key (8μg/L) and south of Vaca and Grassy Keys (3μg/L). South to southwesterly winds may increase the potential for impacts on the oceanside Lower and Middle Keys today, Tuesday and Thursday. Easterly and slight onshore transport is possible south of the Lower and Middle Keys through Thursday. Intensification is not expected through Thursday.

*Fisher, Fenstermacher

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Satellite chlorophyll image with possible HAB areas shown by red polygon(s).Cell concentration sampling data from February 16-22 shown as red squares (high), red triangles (medium), red diamonds (low b), red circles (low a), orange circles (very low b), yellow circles (very low a), green circles (present), and black "X" (not present). For a list of cell count data providers and a key to the cell concentration categories, please see the the HABFS bulletin guide: http://www.csc.noaa.gov/crs/habs/habfs_bulletin_guide.pdf

Wind conditions from Venice Pier, FL

Wind speed and direction are averaged over 12 hours from buoy measurements. Length of line indicates speed; angle indicates direction. Red indicates that the wind direction favors upwelling near the coast. Values to the left of the dotted vertical line are measured values; values to the right are forecasts.

SW Florida: Southwest winds today (10kts, 5m/s), shifting west and variably Tuesday (5-10kts, 3-5m/s). North to northeast winds Tuesday night and easterly on Wednesday (5-10kts, 3-5m/s). Stronger southeast winds expected Thursday (15-20kts, 8-10m/s).

Keys: South winds (10-15kts, 5-8m/s)today, shifting southwest tonight into Tuesday (10kts, 5 m/s). East winds Wednesday (10kts, 5 m/s). East to southeast winds Thursday (10-15kts, 5-8m/s).

C. Bloom Analysis

Interpretation of all available data. Sent to managers to guide sampling efforts and event response

Analysis

Sampling continues to confirm the absence of *K. brevis* along the SW Florida coast. Chlorophyll levels correspond with these reports, having generally dissipated over much of the coastline in the past few weeks. Chlorophyll does remain elevated in a band approximately 2nm offshore northern Collier County from Barefoot Beach to Naples Pier, with a maximum chlorophyll concentration of approximately 7μg/L at 26°14.5'N 81°51.3'W. Sampling is recommended. Chlorophyll levels south of Cape Romano have decreased slightly since last reported. Both regions will continue to be monitored via satellite imagery. Onshore transport of identified features is possible today and Tuesday. Intensification through Thursday is not expected.

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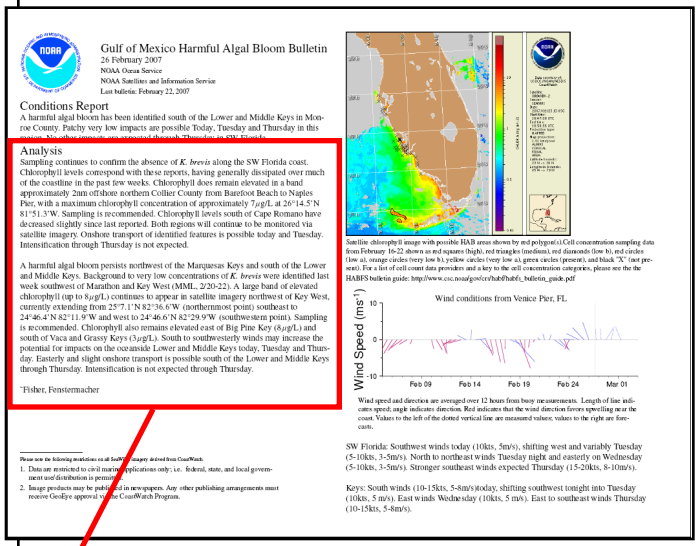
~Fisher, Fenstermacher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Analysis

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A harmful algal bloom persists northwest of the Marquesas Keys and south of the Lower and Middle Keys. Background to very low concentrations of *K. brevis* were identified last week southwest of Marathon and Key West (MML, 2/20-22). A large band of elevated chlorophyll (up to 8μg/L) continues to appear in satellite imagery northwest of Key West, currently extending from 25°7.1'N 82°36.6'W (northernmost point) southeast to 24°46.4'N 82°11.9'W and west to 24°46.6'N 82°29.9'W (southwestern point). Sampling is recommended. Chlorophyll also remains elevated east of Big Pine Key (8μg/L) and south of Vaca and Grassy Keys (3μg/L). South to southwesterly winds may increase the potential for impacts on the oceanside Lower and Middle Keys today, Tuesday and Thursday. Easterly and slight onshore transport is possible south of the Lower and Middle Keys through Thursday. Intensification is not expected through Thursday.

~Fisher, Fenstermacher

Please note the following restrictions on all SeaWiFS imagery derived from CoastWatch:

1. Data are restricted to civil marine applications only; i.e. federal, state, and local government use/distribution is permitted.
2. Image products may be published in newspapers. Any other publishing arrangements must receive GeoEye approval via the CoastWatch Program.

Satellite chlorophyll image with possible HAB areas shown by red polygon(s). Cell concentration sampling data from February 16-22 shown as red squares (high), red triangles (medium), red diamonds (low b), red circles (low a), orange circles (very low b), yellow circles (very low a), green circles (present), and black "X" (not present). For a list of cell count data providers and a key to the cell concentration categories, please see the the HABFS bulletin guide: http://www.csc.noaa.gov/crs/habfs/habfs_bulletin_guide.pdf

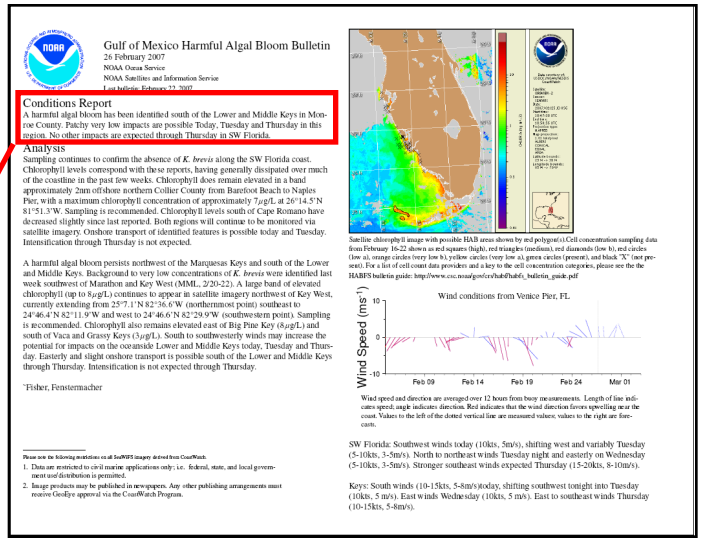
Wind speed and direction are averaged over 12 hours from buoy measurements. Length of line indicates speed; angle indicates direction. Red indicates that the wind direction favors upwelling near the coast. Values to the left of the dotted vertical line are measured values; values to the right are forecasts.

SW Florida: Southwest winds today (10kts, 5m/s), shifting west and variably Tuesday (5-10kts, 3-5m/s). North to northeast winds Tuesday night and easterly on Wednesday (5-10kts, 3-5m/s). Stronger southeast winds expected Thursday (15-20kts, 8-10m/s).

Keys: South winds (10-15kts, 5-8m/s)today, shifting southwest tonight into Tuesday (10kts, 5 m/s). East winds Wednesday (10kts, 5 m/s). East to southeast winds Thursday (10-15kts, 5-8m/s).

D. Public Advisory

Current conditions and forecast of beach impacts over the next few days



Gulf of Mexico Harmful Algal Bloom Bulletin
26 February 2007
NOAA Ocean Service
NOAA Satellites and Information Service
Last bulletin: February 22, 2007

Conditions Report
A harmful algal bloom has been identified south of the Lower and Middle Keys in Monroe County. Patchy very low impacts are possible Today, Tuesday and Thursday in this region. No other impacts are expected through Thursday in SW Florida.

Analysis
Sampling continues to confirm the absence of *K. brevis* along the SW Florida coast. Chlorophyll levels correspond with these reports, having generally dissipated over much of the coastline in the past few weeks. Chlorophyll does remain elevated in a band approximately 2nm offshore northern Collier County from Barefoot Beach to Naples Pier, with a maximum chlorophyll concentration of approximately 7μg/L at 26°14.5'N 81°51.3'W. Sampling is recommended. Chlorophyll levels south of Cape Romano have decreased slightly since last reported. Both regions will continue to be monitored via satellite imagery. Onshore transport of identified features is possible today and Tuesday. Intensification through Thursday is not expected.

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Wind conditions from Venice Pier, FL
Wind Speed (ms^{-1})
10
0
-10
Feb 09
Feb 14
Feb 19
Feb 24
Mar 01

Wind speed and direction are averaged over 12 hours from buoy measurements. Length of line indicates speed; angle indicates direction. Red indicates that the wind direction favors upwelling near the coast. Values to the left of the dotted vertical line are measured values; values to the right are forecasts.

SW Florida: Southwest winds today (10kts, 5m/s), shifting west and variably Tuesday (5-10kts, 3-5m/s). North to northeast winds Tuesday night and easterly on Wednesday (5-10kts, 3-5m/s). Stronger southeast winds expected Thursday (15-20kts, 8-10m/s).

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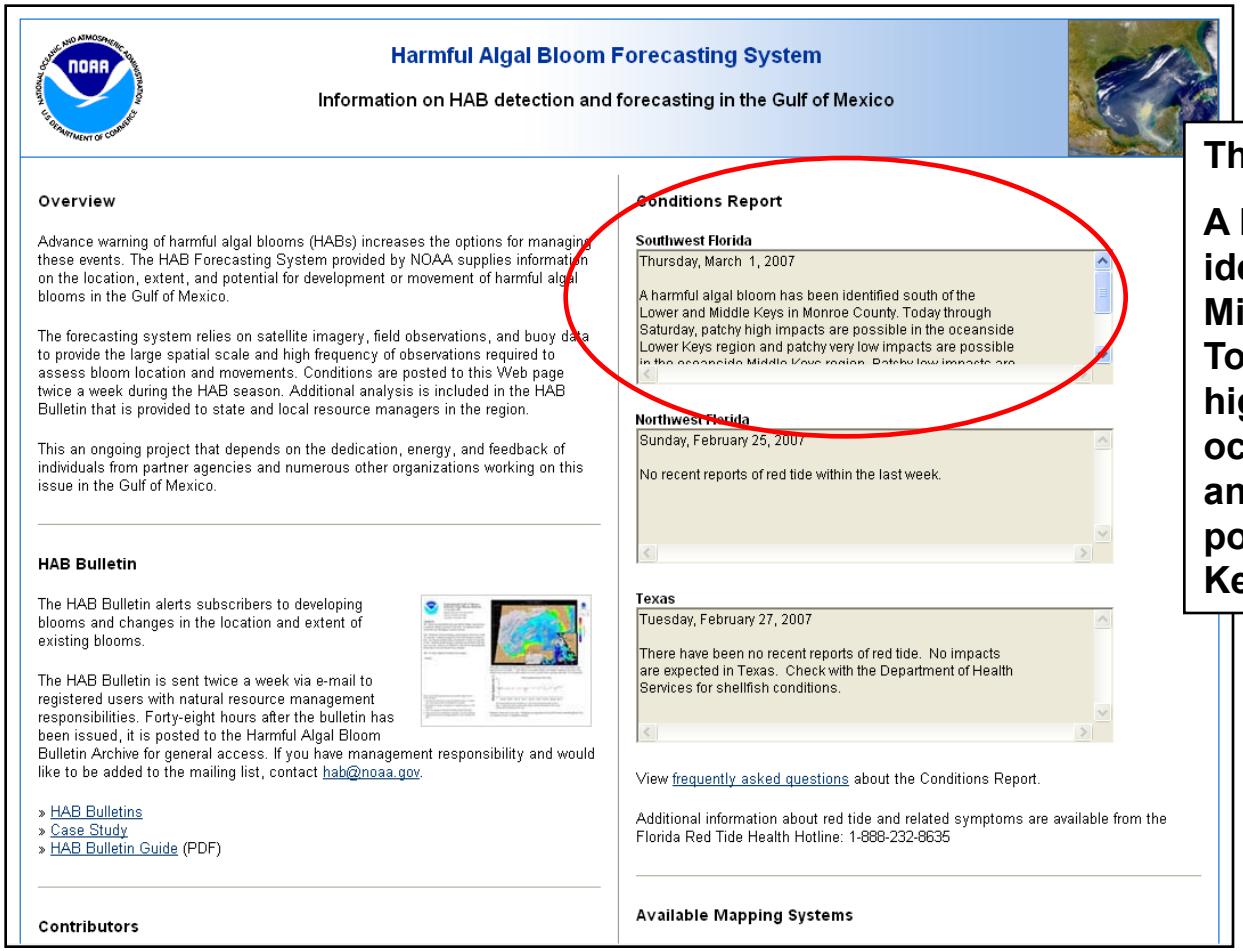
Conditions Report

A harmful algal bloom has been identified south of the Lower and Middle Keys in Monroe County. Patchy very low impacts are possible Today, Tuesday and Thursday in this region. No other impacts are expected through Thursday in SW Florida.

HAB Forecasting System Web site



Harmful Algal Bloom Forecasting System

Information on HAB detection and forecasting in the Gulf of Mexico

Overview

Advance warning of harmful algal blooms (HABs) increases the options for managing these events. The HAB Forecasting System provided by NOAA supplies information on the location, extent, and potential for development or movement of harmful algal blooms in the Gulf of Mexico.

The forecasting system relies on satellite imagery, field observations, and buoy data to provide the large spatial scale and high frequency of observations required to assess bloom location and movements. Conditions are posted to this Web page twice a week during the HAB season. Additional analysis is included in the HAB Bulletin that is provided to state and local resource managers in the region.

This an ongoing project that depends on the dedication, energy, and feedback of individuals from partner agencies and numerous other organizations working on this issue in the Gulf of Mexico.

HAB Bulletin

The HAB Bulletin alerts subscribers to developing blooms and changes in the location and extent of existing blooms.

The HAB Bulletin is sent twice a week via e-mail to registered users with natural resource management responsibilities. Forty-eight hours after the bulletin has been issued, it is posted to the Harmful Algal Bloom Bulletin Archive for general access. If you have management responsibility and would like to be added to the mailing list, contact hab@noaa.gov.

» HAB Bulletins
» Case Study
» HAB Bulletin Guide (PDF)

Contributors

Conditions Report

Southwest Florida

Thursday, March 1, 2007

A harmful algal bloom has been identified south of the Lower and Middle Keys in Monroe County. Today through Saturday, patchy high impacts are possible in the oceanside Lower Keys region and patchy very low impacts are possible

Northwest Florida

Sunday, February 25, 2007

No recent reports of red tide within the last week.

Texas

Tuesday, February 27, 2007

There have been no recent reports of red tide. No impacts are expected in Texas. Check with the Department of Health Services for shellfish conditions.

View frequently asked questions about the Conditions Report.

Additional information about red tide and related symptoms are available from the Florida Red Tide Health Hotline: 1-888-232-8635

Available Mapping Systems

Public notice

Thursday, March 1, 2007

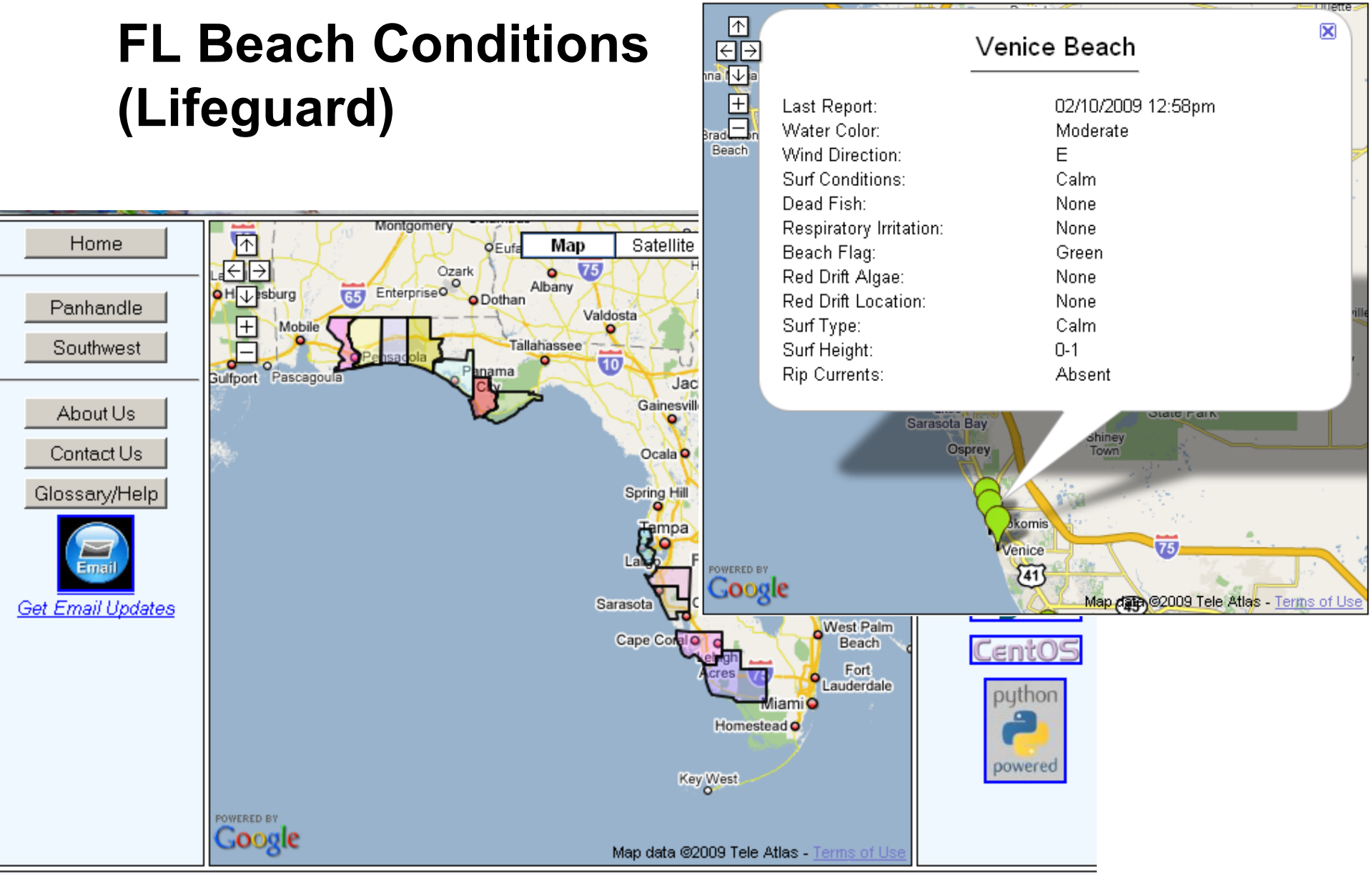
A harmful algal bloom has been identified south of the Lower and Middle Keys in Monroe County. Today through Saturday, patchy high impacts are possible in the oceanside Lower Keys region and patchy very low impacts are possible in the oceanside Middle Keys region.

Information only on verified HABs

No jargon, specific wording

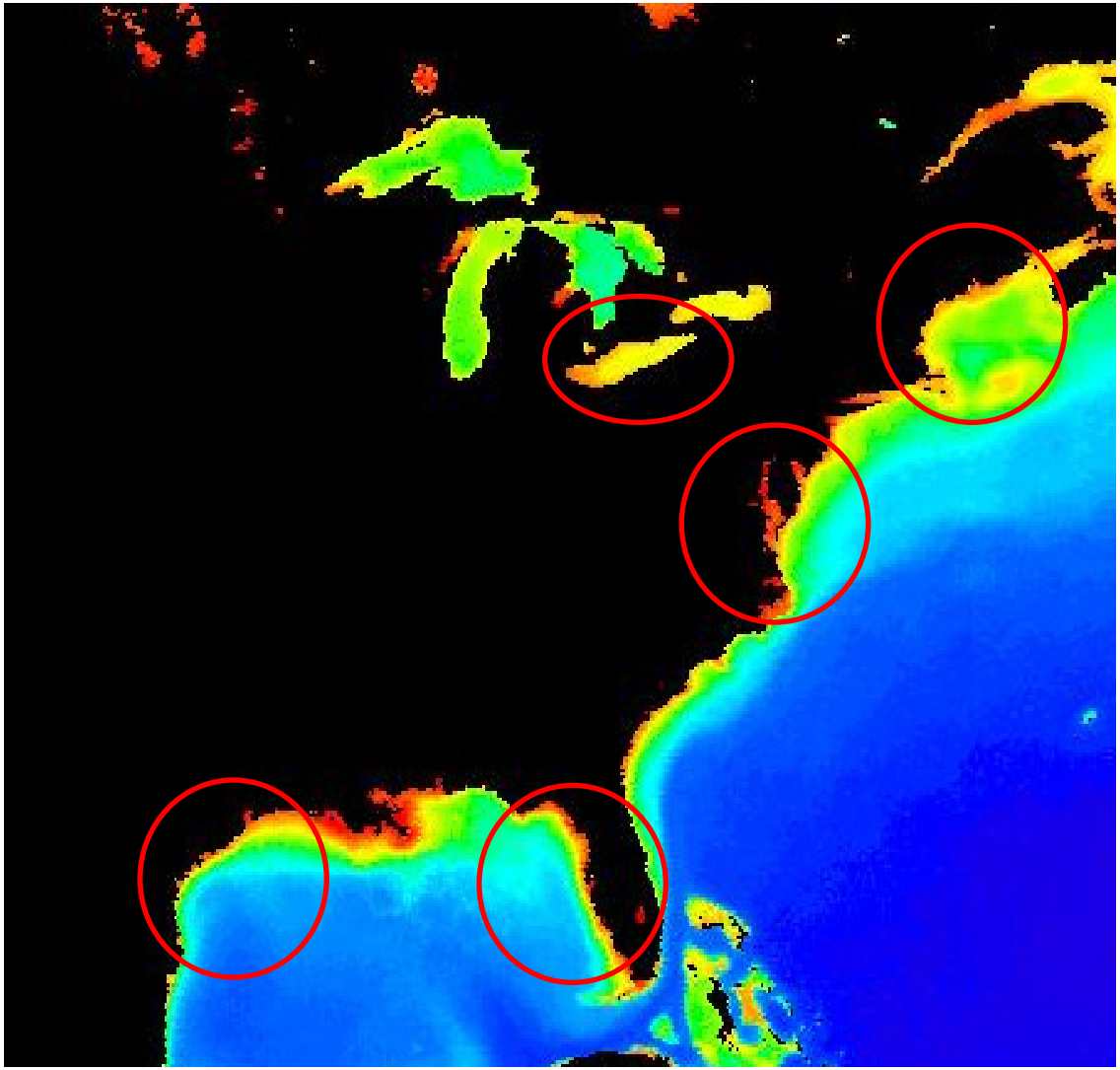
http://www.csc.noaa.gov/crs/habf

FL Beach Conditions (Lifeguard)



Example areas within US with HAB monitoring/forecast systems

West coast is described at this meeting



Texas

Sign up for e-mail updates BOOKMARK

Harmful Algal Blooms:

- Golden Alga
- Brown Tide
- Red Tide
- Other Harmful Algae
- HAB Research

Red Tide Information:

- FAQ

Current Status

January 20, 2009

Red tide has not caused any fish kills or respiratory irritation along the Texas coast since October 2006. Bays that were closed to shellfish harvesting due d tide have reopened. Information ut shellfish closures can be obtained by contacting the Seafood and atic Life group of the TDSHS at (800) 685-0361.

RED TIDE IN TEXAS

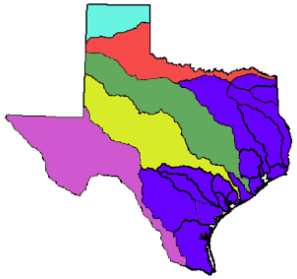
Golden Alga Bloom Status Reports

Please note: Evidence of a fish kill due to golden alga may be difficult to track and discover. Large numbers of small fish may be killed, and predators such as birds and raccoons can eat the large dead fish before they are observed or counted. Additionally, the dead fish sink below the surface very quickly; this also interferes with complete counts. For this reason, an area that had large numbers of dead fish one day may show nothing the next day, while other areas that are without dead fish may have large numbers of fish die soon after. These rapid changes necessitate quick notification of kills. Accurate numbers are only as good as the evidence available on the scene. The public is asked to please report all dead or dying fish and wildlife as soon as possible to the Texas Parks and Wildlife Department. Call one of the 24-Hour Communications Centers (512-389-4848 (Austin) or 281-842-8100 (Houston)), one of the Kills and Spills Team biologists, or your local Game Warden.

View Most Recent Statewide Updates

View Reports by Basin

- Canadian River Basin
  - Stilling Basin of Lake Meridith
- Red River Basin
  - Lake Baylor
  - Lake Childress
  - Lake Diversion
  - Lake Kemp
  - Lake Pauline
  - Lake Texoma
  - Lake Wichita
  - Plum Lake
  - Red River
  - Wichita River
- Brazos River Basin



Click on a river basin above to view expanded status reports by basin

Texas, a success story of coordination

Texas, TexHAB averted a disaster:

- March 2007 *Dinophysis* in Corpus Christi Bay, never reported before as a HAB in the GOM

Week of major oyster festival. Oyster recall; fresh oysters for festival; no cases of DSP.

First spotted by TAMU experimental video sensor

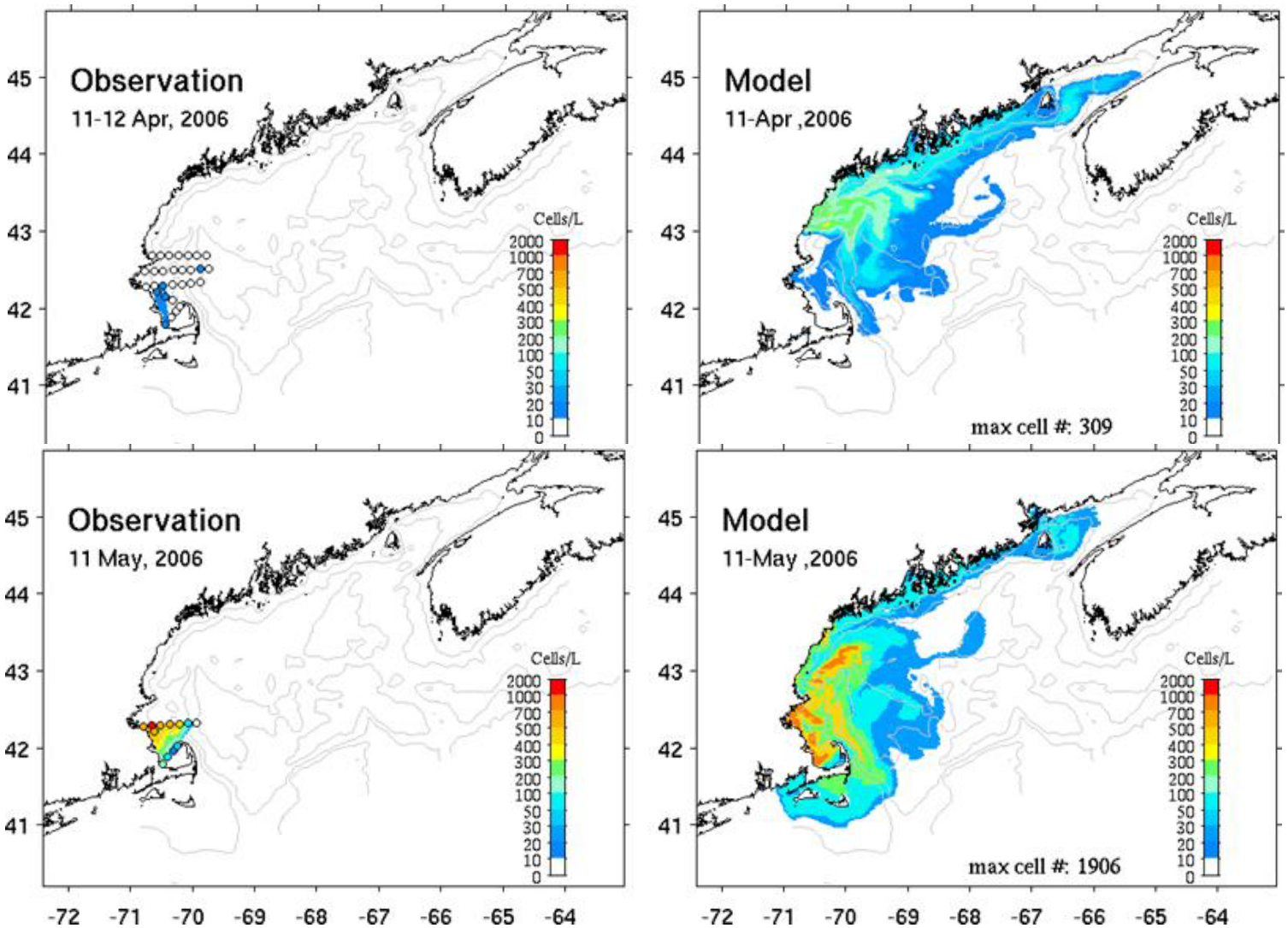
Linkage across Texas community through TexHAB

Support by various groups:

- sampling by PMN, modeling by NOAA and TGLO/TAMU.

Planning has begun on transition of GMaine forecasts from research (WHOI/NCSU) to operations (NOAA). Workshops with state mgrs Dec 06; Jun 08; Mar 09.

McGillicuddy, He, Anderson et al.



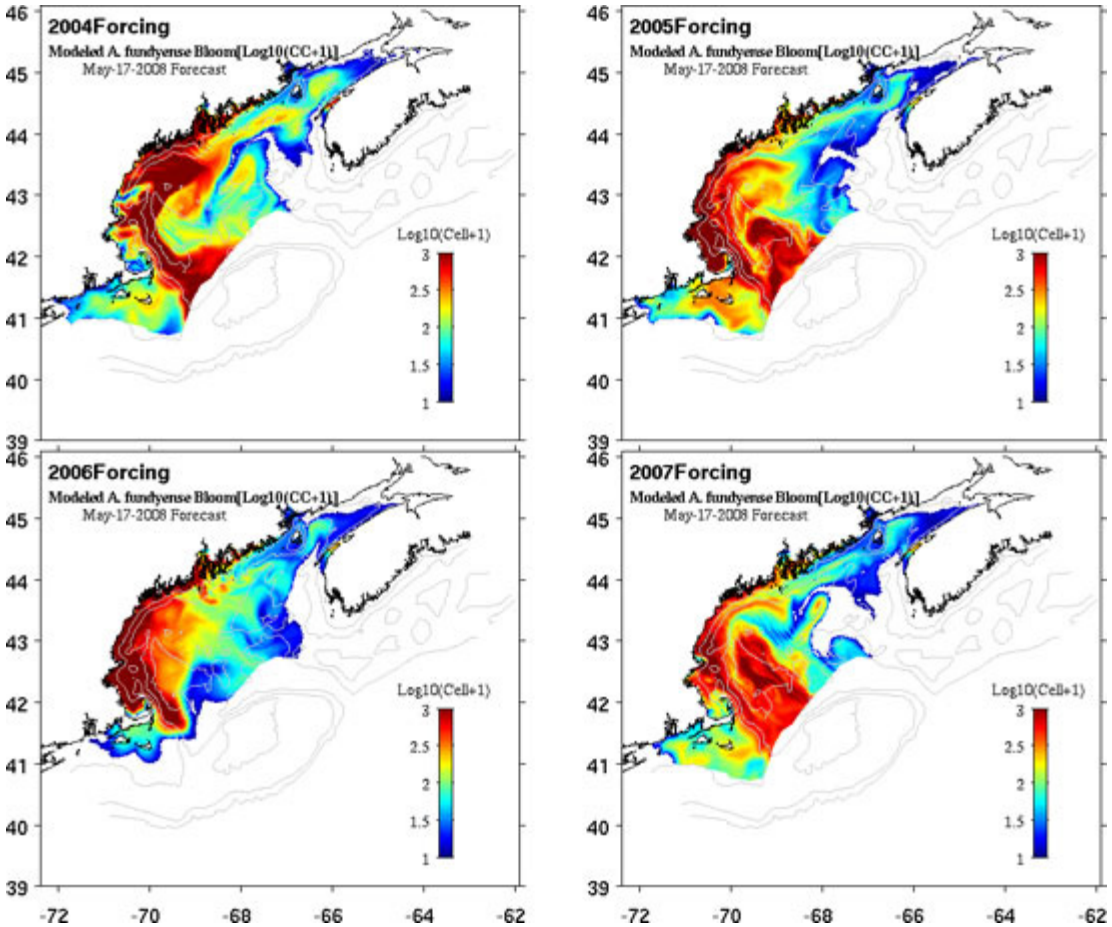
Gulf of Maine, *Alexandrium* Forecast Success

2008 First Seasonal forecast;

proved to be correct.

Seasonal forecast is highest priority for managers in the region.

Reduces public impact.



Components of Gulf of Maine transition to operational (from workshops)

Draft transition outline for the next two years.

Data Acquisition Plan.

Cyst Map (design, cost, implementation)

HAB Sensors

- Strategy for installing HAB sensors (IOOS linkage)

Model

- Establish appropriate links/requirements with NOAA/NCEP

Product Types

Identify product requirements that differ from current products

- Seasonal forecast
- Real-time forecast
- Public Information

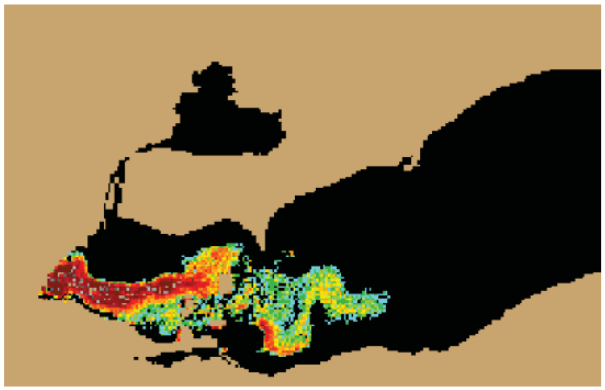
Microcystis Demonstration, in Lake Erie summer 2008 NOAA (GLERL, MI Sea Grant)

EXPERIMENTAL
Lake Erie Harmful Algal Bloom Bulletin
17 September 2008
National Ocean Service
Great Lakes Environmental Research Laboratory
Last bulletin: 4 September 2008

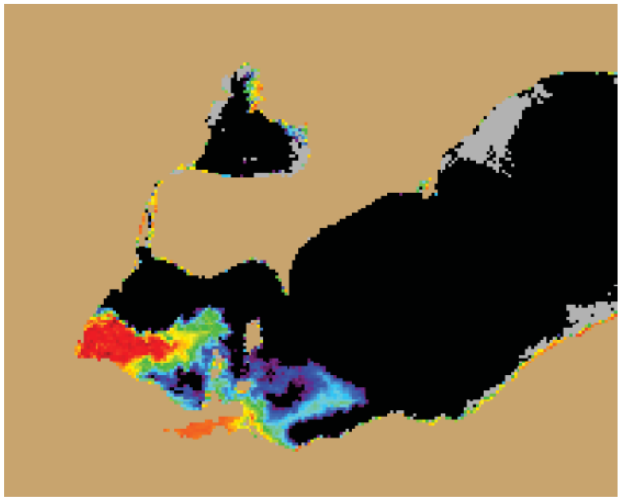
Conditions: A *Microcystis aeruginosa* bloom continues in western Lake Erie from the Maumee River mouth eastward and in Sandusky Bay.

Analysis: The *Microcystis aeruginosa* bloom continues in western Lake Erie. The bloom appears to have moved northward according to imagery and sampling on September 11, 2008, with the northeast corner at approximately -82.8166W and 41.8461N. Modeled transport indicates that the bloom, on 9/15, may have extended further eastward into the middle of the Lake, with the easternmost point at -82W 41.6949N. Recent imagery is unavailable to confirm. As of 9/11 the mixed cyanobacterial bloom is still present in Sandusky Bay.
Further sampling is recommended.

-Tomlinson, Stumpf



Modeled position on 9/15 of *Microcystis* bloom using the Great Lakes Operational Forecasting System's (GLOFS) modeled currents to move bloom from 9/11 image.



Imagery shows the spectral shape at 681 nm from September 11, 2008, colored pixels indicate the likelihood of last known position of *Microcystis* (with red being most likely).

Please note:
1. MERIS Imagery was distributed by the NOAA Coastwatch Program and provided by the European Space Agency
2. Cell counts were collected by the Great Lakes Environmental Research Laboratory
3. The wind data is available throught the National Data Buoy

Lake Erie Components

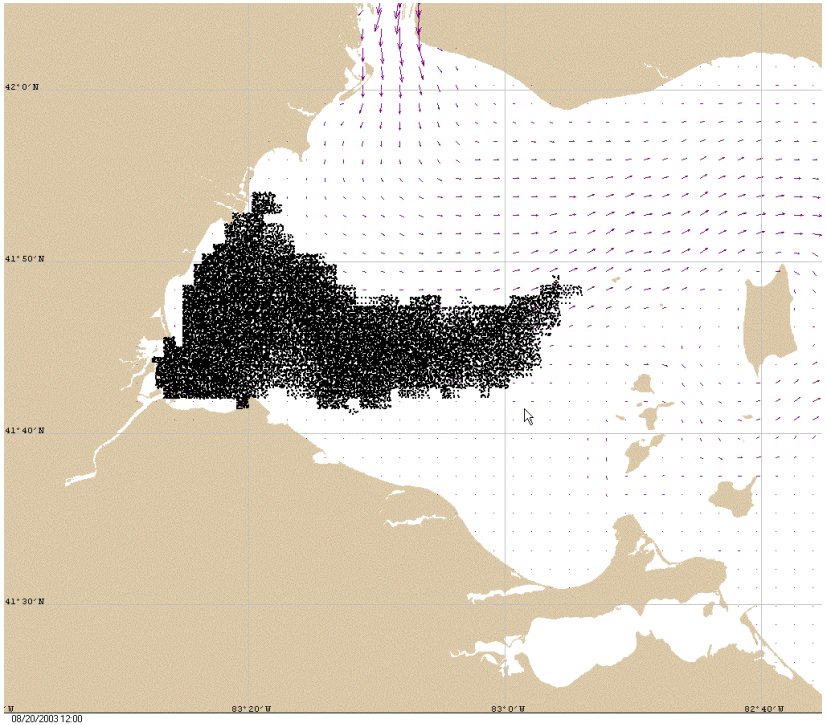
MERIS satellite imagery (spectral shape algorithm)

Great Lakes Coastal Forecast System (operational & research)

Field Observations

Coordination with users (water supply and recreation) through connections made by Center of Excellence for Great Lakes and Human Health—CEGLHH)

Information distribution limited, evaluation on going



Maryland monitoring of Chesapeake Bay

Microcystis: public health

Karlodinium: fish kills, (possible health)

Prorocentrum: fish kills (possible shellfish)

Chesapeake Bay Coastal Bays Rivers & Streams Watersheds

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Harmful Algae Blooms In Maryland

Latest News and Results:

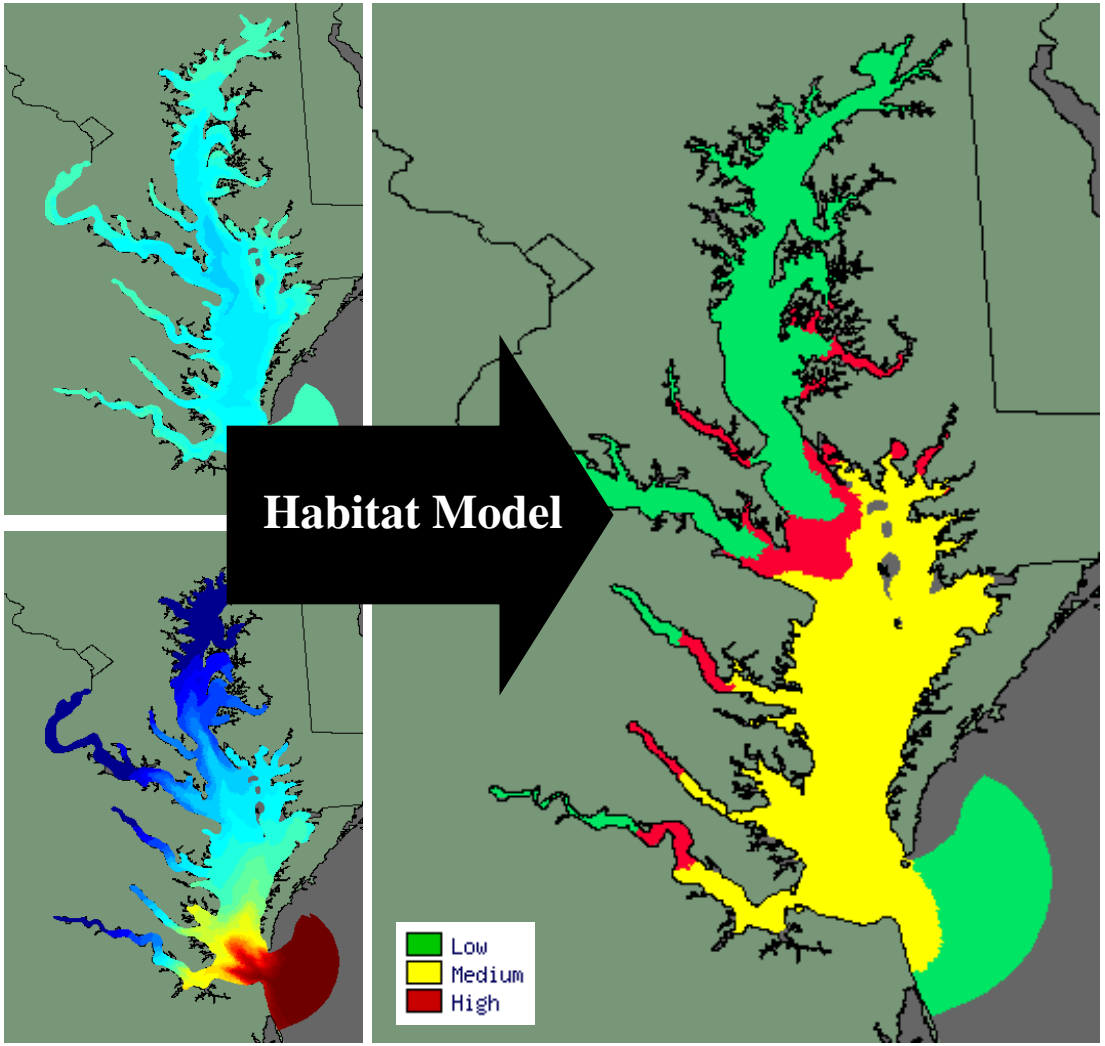
- 8/15/08 *Microcystis blooms on Mattawoman Creek, Potomac River*
- 5/1/08 *Pseudoanabaena bloom reported in the Sassafras River*
- 5/2/08 *Microcystis* Bloom Continues in the transquaking River
- 4/30/08 *Prorocentrum minimum* Algal Bloom Reported off the Mouth of the Potomac River
- 4/23/08 First Microcystis Bloom of 2008 Reported in the Chicamicomico and Transquaking River Systems
- 4/16/08 First Large Mahogany Tide of 2008 Reported off Mouth of the Patuxent River

Learn More About:

- Brown Tide
- *Chattonella*
- Macroalgae
- Mahogany Tide
- *Microcystis*
- *Pfiesteria*
- Other Species
- Current Blooms
- Search HAB News
- Report a Bloom
- HAB Home

Probablistic: Research predictions of *Karlodinium veneficum*

1. Generate daily nowcasts and 3-d forecasts using SST, salinity, and month
2. Simulate ambient surface salinity and temperature fields
3. Apply habitat model
4. Generate image illustrating the relative abundance of *K. veneficum*



Delaware, Volunteer program, coordinated with state

Delaware's HAB Monitoring and Response Program

What's in the water in Delaware?
What are the potential effects?
What is being done?

Goin' Green!
...or Brown
...or Red

Ed Whereat and Muns Farestad
University of Delaware Citizen Monitoring Program
Phytoplankton Monitoring Program

DNREC HAB Monitoring Program

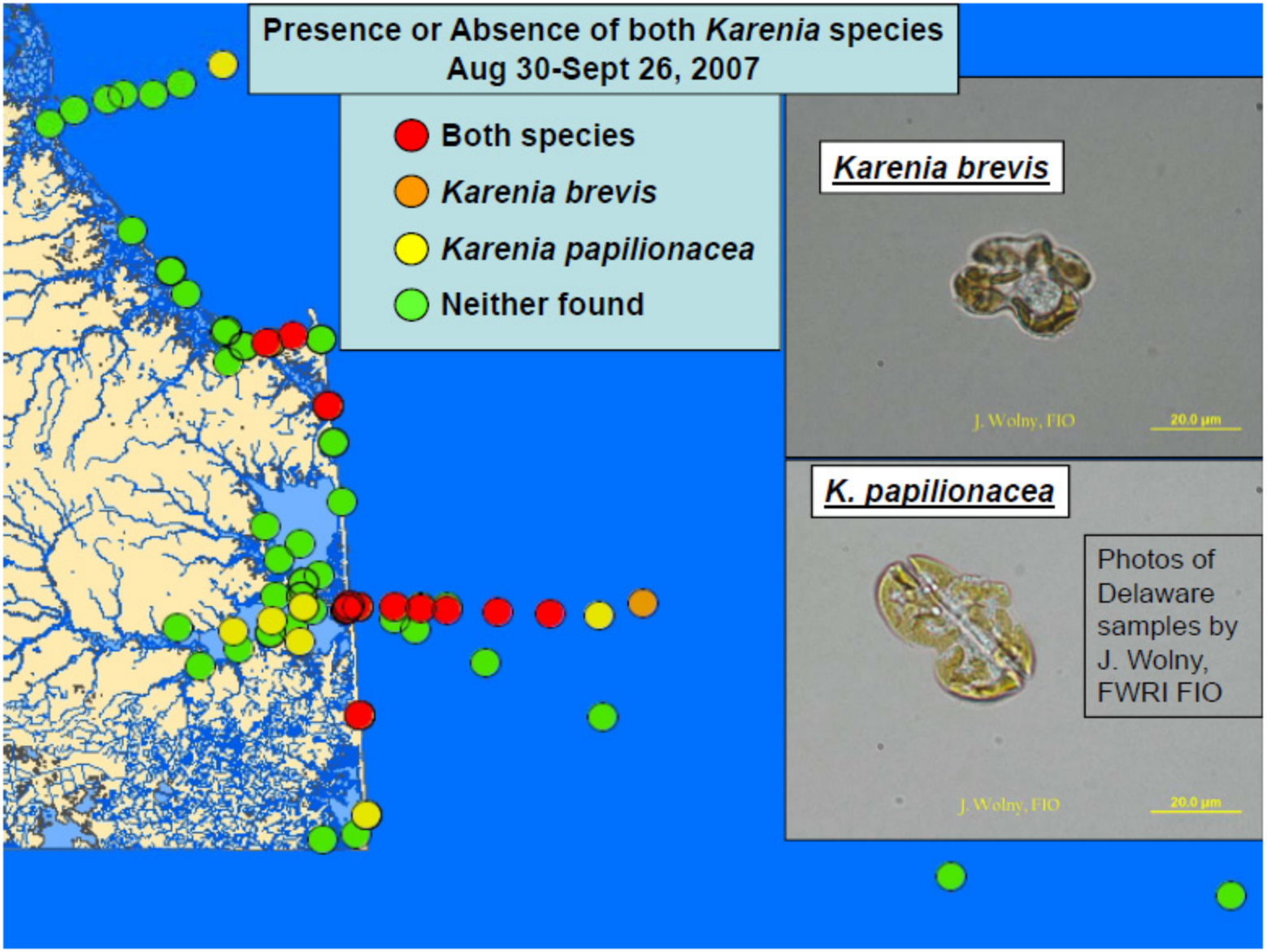
Sea Grant
University of Delaware

Delaware Department of Natural Resources and Environmental Control

Center for the Inland Bays

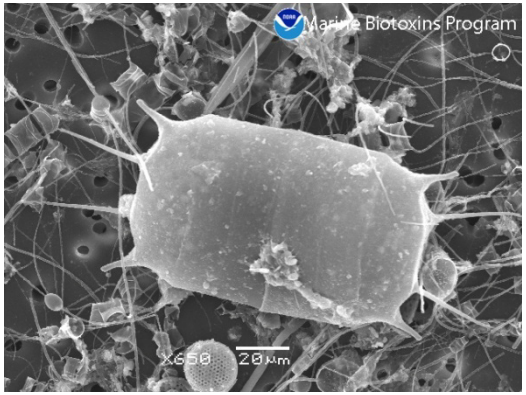
University of Delaware
College of Marine and Earth Studies

Delaware, 2007; citizen monitoring found *Karenia*, 2nd time north of Florida



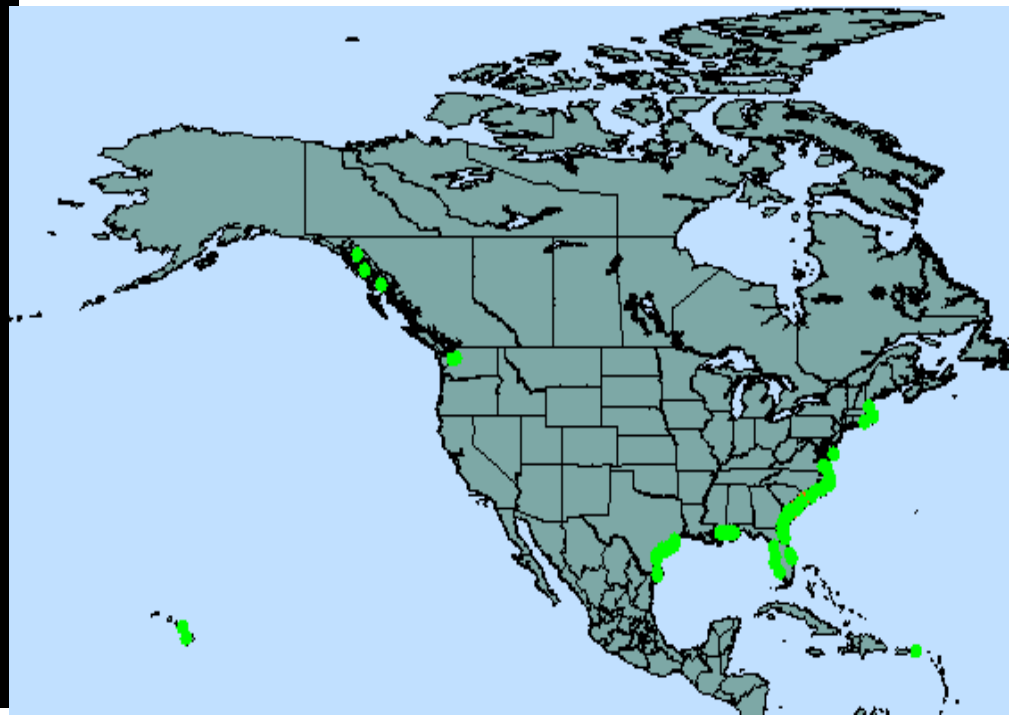
Volunteer Phytoplankton Monitoring Network

- Established by NOAA's Marine Biotoxins Program, 2001 in SC
- Unites volunteers and NOAA scientists
- Sampling takes place on a weekly or bi-monthly basis
- Equipment provided
- Results enable researchers to identify problem areas



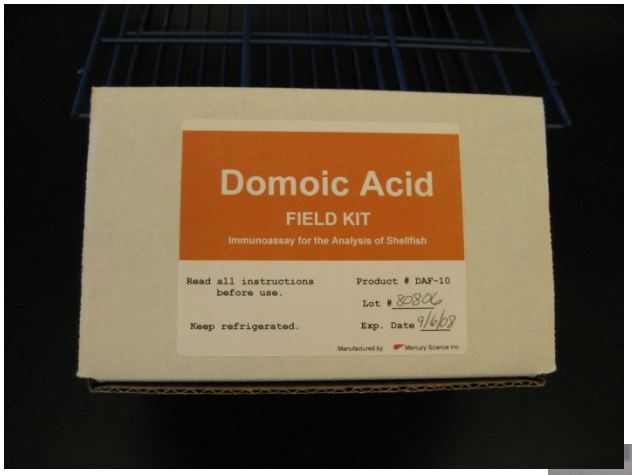
Demographics

- 148 Sites Monitored
- States include New Hampshire, Connecticut, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Texas, Washington, Alaska, Hawaii and the US Virgin Islands

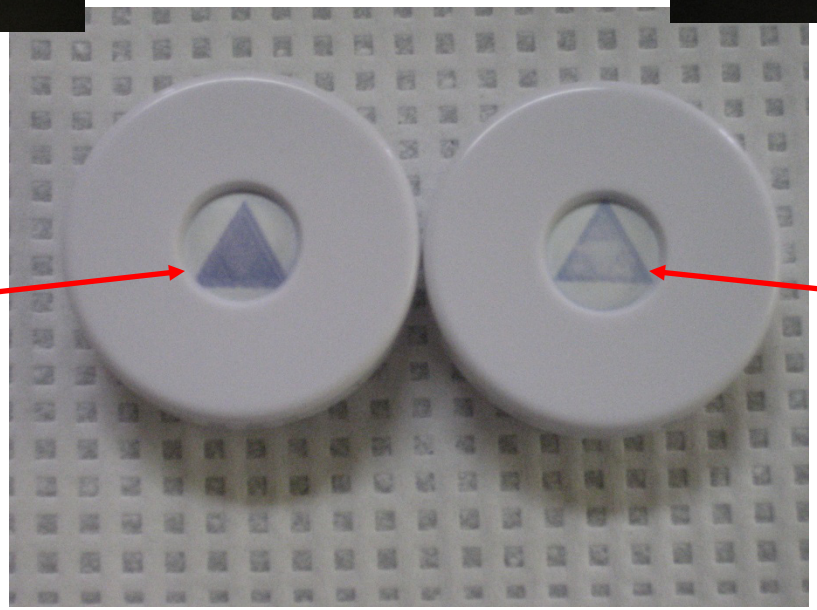


http://www.chbr.noaa.gov/pmn/

Rapid Detection methods combined with volunteers can improve resolution



Field Detection Kit
Wayne Litaker's work

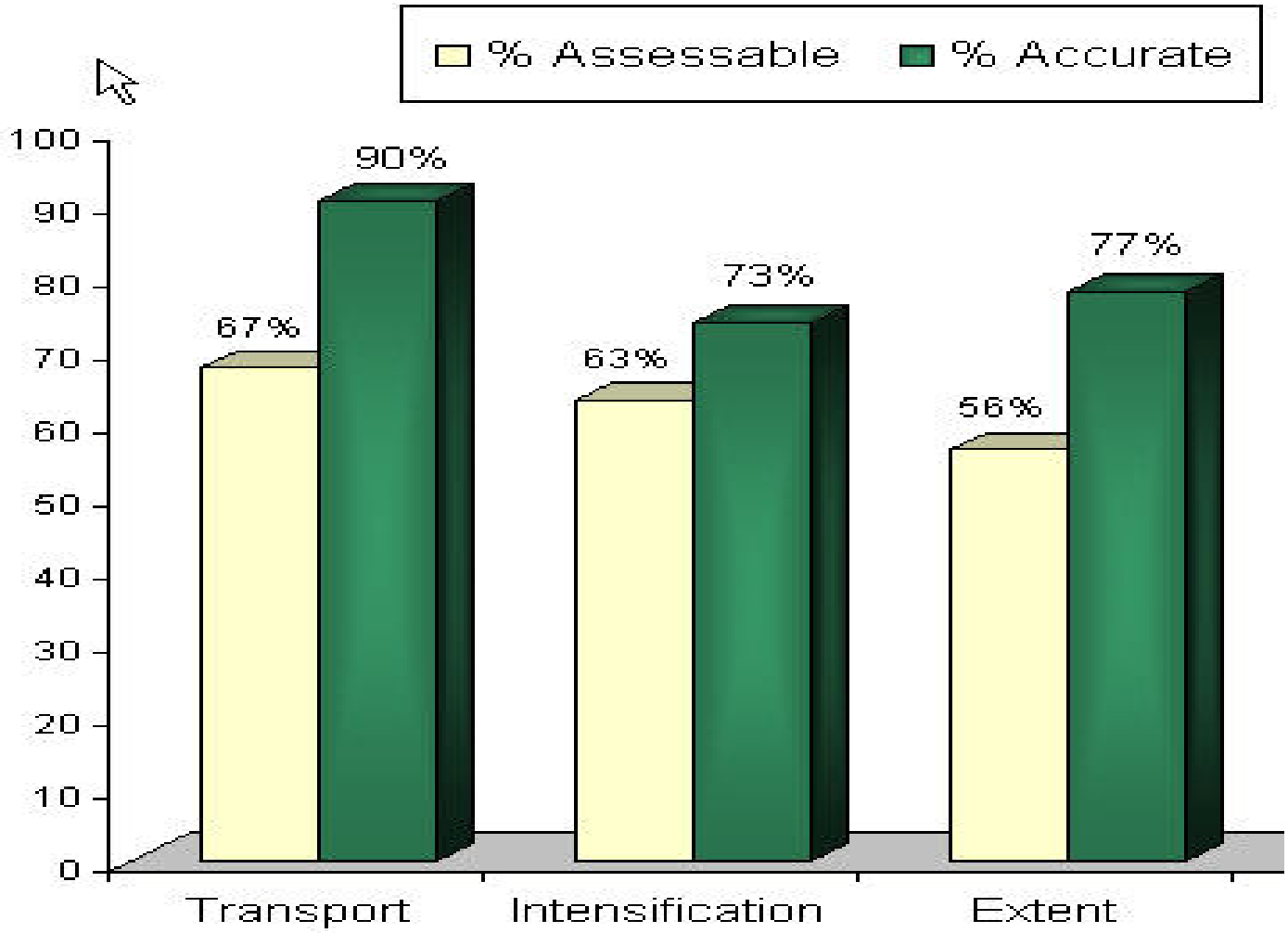


Low DA
Dark color

High DA
Light color

Evaluation of forecasts, important part of operational system

NOAA Operational system, eastern Gulf of Mexico: Accuracy is high because of low resolution, efforts underway to improve resolution



Importance of Resolution on Forecast Accuracy

Resolution at the Coast (Florida)	30 km per day
Forecast Resolution	30-60 km per day
Accuracy at 30-60 km	73% correct
Accuracy at 10 km	21% correct
Resolution is only as good as the resolution of the initialization data. (1 km satellite pixels do not produce 1 km/day resolution)	

NOAA Concept for National System of Regional HAB Forecasts

Where	What
Florida/eastern GMex	Operational as of 2004
Texas	Demonstration as of 2006
Lake Erie	Demonstration development/evaluation
Gulf of Maine	Demonstration as of 2005, transition
California	
Pacific NW	

Data Types as input	***Possible Solution***
Toxin/cell levels	State/regional managed
Heuristic models	Translate research to tools & training
Circulation/ transport models	IOOS Backbone Transfer research / demo to operations
Met & current obs	IOOS Backbone & RAs
Imagery (color & temp)	IOOS Backbone
Analysis	Based with local experts
Integration & analysis tools	Web-based, NOAA–supported
Other data (probes, obs)	RA/State/local/other

Recommendation to succeed with a Nowcast/Forecast, work backwards

Start small: one or two objectives for the managers

e.g., where was the bloom in the last few days

where do we think it is tomorrow

Don't confuse research interests with management interests

(a GIS web site with all the data can is really interesting, but . . .)

Get toxin/cell counts into some common type

(Low, Medium, High)

Figure out the basic heuristic model, then decide on the other models and other observations

Analysis is necessary, and a common standard for analysis is more necessary.