

New Jersey's Marine HAB Monitoring

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NJDEP Bureau of Marine Water Monitoring

NJ Water Monitoring Council

September 23, 2015

Algal Blooms and Human Health

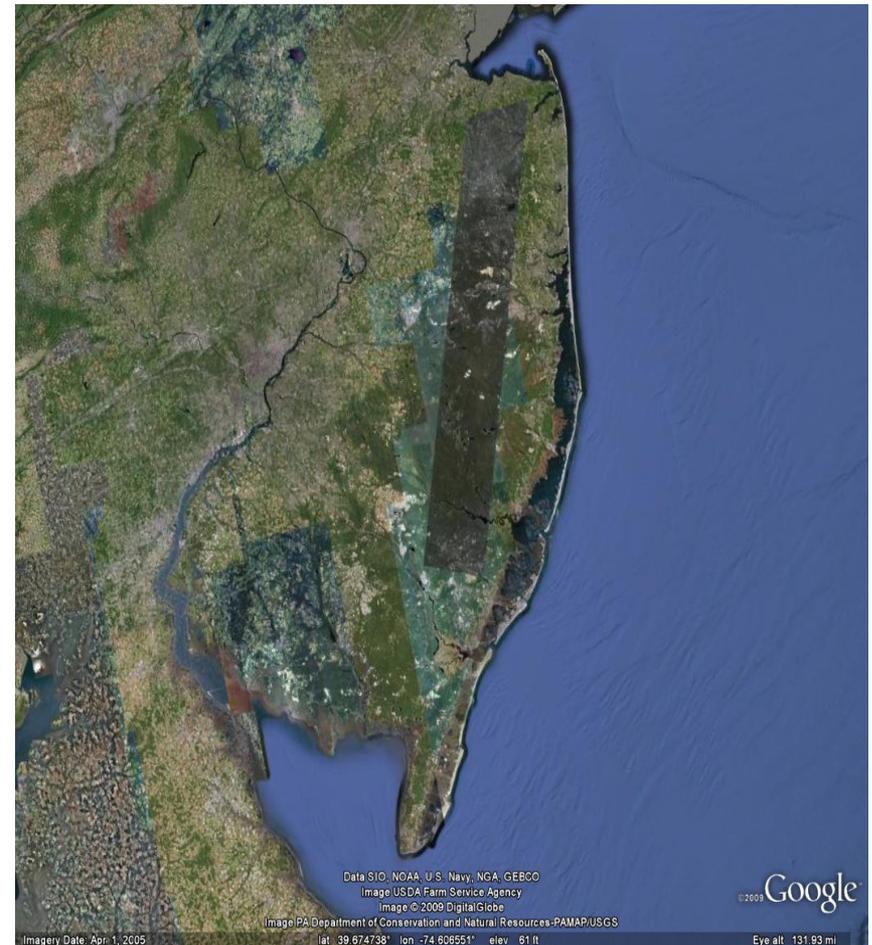
- Harmful algal blooms (HABs) can affect humans by producing toxins that are accumulated in Fish and Shellfish.
- Many algal blooms, even if not considered harmful have been known to produce respiratory distress and skin irritation to bathers.
- Algal Blooms also have an impact on the ecology of systems by causing low dissolved oxygen conditions.

Major Harmful Algal Species on the U.S. East Coast

- *Alexandrium spp.* – Paralytic Shellfish Poisoning (PSP) – currently found from Maine to Long Island.
- *Karenia brevis* – Neurotoxic Shellfish Poisoning (NSP) – Found from Florida up to Delaware.
- *Pseudonitzschia seriata* – Amnesic Shellfish Poisoning (ASP) – Found along the whole East Coast, typically not in blooms.
- *Dinophysis spp.* and *Prorocentrum lima* – Diarrhetic Shellfish Poisoning (DSP) - Found along the whole East Coast, typically not in blooms.

Monitoring New Jersey's Coast

- New Jersey has ~ 120 miles of coastline.
- To protect the Public, monitoring must be able to cover all of the state on a routine basis.
- Aircraft Remote sensing of Chlorophyll *a* was added to monitor for algal blooms in 2007.
- Sensor is mounted on the NJDEP Forest Fire Service plane used for the Coastal Surveillance Flights.



Routine Monitoring

- 43 Stations sampled routinely as part of our NSSP bacteria sampling program.
- Samples from our monthly ambient nutrient monitoring program with high chlorophyll concentrations are ID for phytoplankton species.
- Coastal Flights with chlorophyll remote sensing is performed weekly, from April 1 to ~May 18, then 6 Days/week (weather permitting) thru Labor Day. Barnegat Bay Flights were added in 2008. After Labor Day, flights will be performed once weekly thru October.
- All images are available on the Internet at www.state.nj.us/dep/bmw/
- Numerous Blooms were targeted for sampling and identification.
- Sampling is initiated after multiple days of high chlorophyll a concentrations.
- Slocum glider deployments in the ocean are also being used to identify algal blooms. 3 deployments July-Sept. each year.



July 2008 Raritan Bay Algae bloom

Remote sensing data from Saturday July 12, 2008, showed the start of an algal bloom in the western end of Raritan Bay. Sunday the remote sensing data showed that the bloom had intensified some chlorophyll a values were estimated to be 100 ug/l. On Tuesday a boat was sent on the water to investigate the area, 22 samples were collected and analyzed for chlorophyll a, and a subset was looked at for species identification. Remote sensing data was also collected on Tuesday, and covered the area farther offshore than the boat.



Date

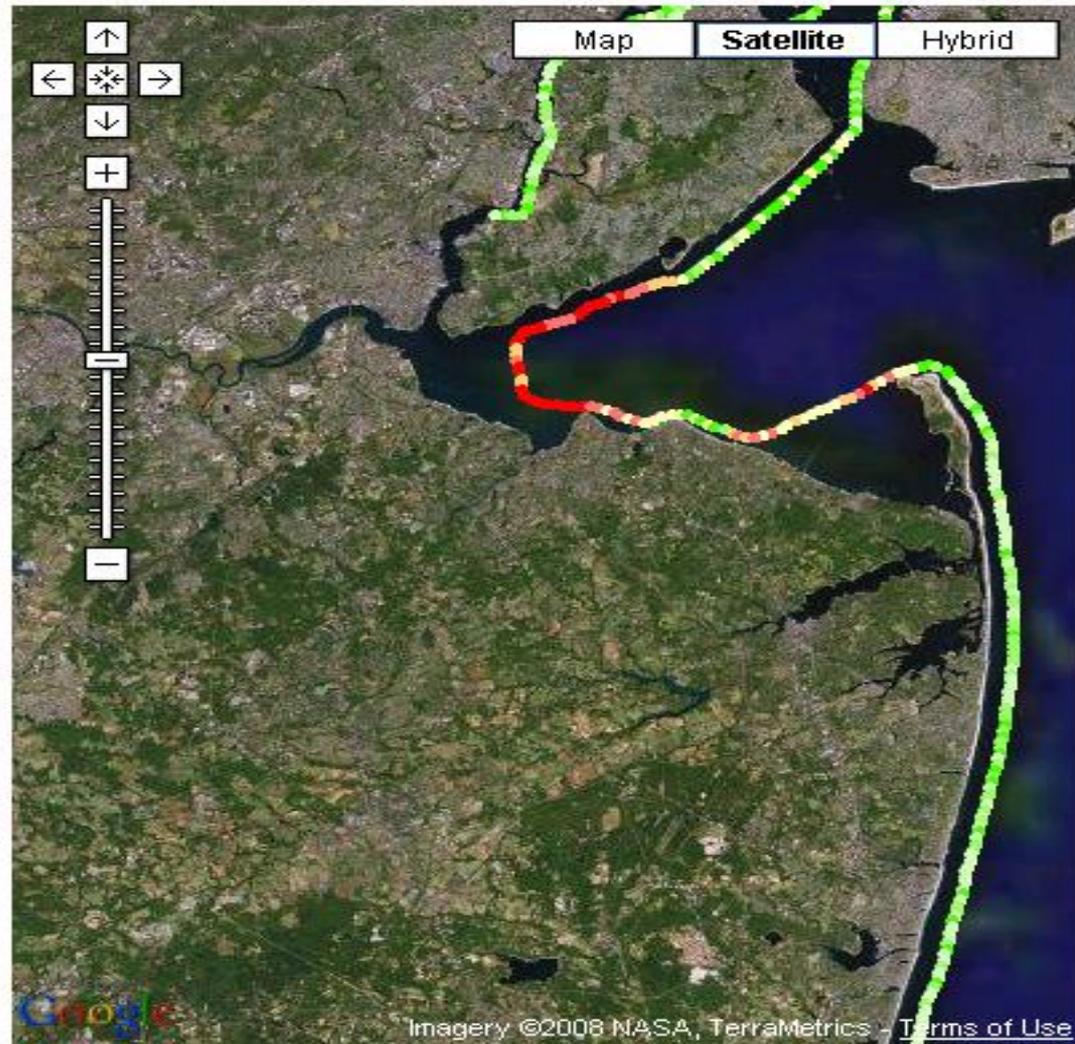
(Year Month Day)

20080712 ▾

Legend

Est. Chlorophyll
a ug/L

-  0-3
-  3-6
-  6-12
-  12-24
-  24-35
-  35-50
-  > 50



Date

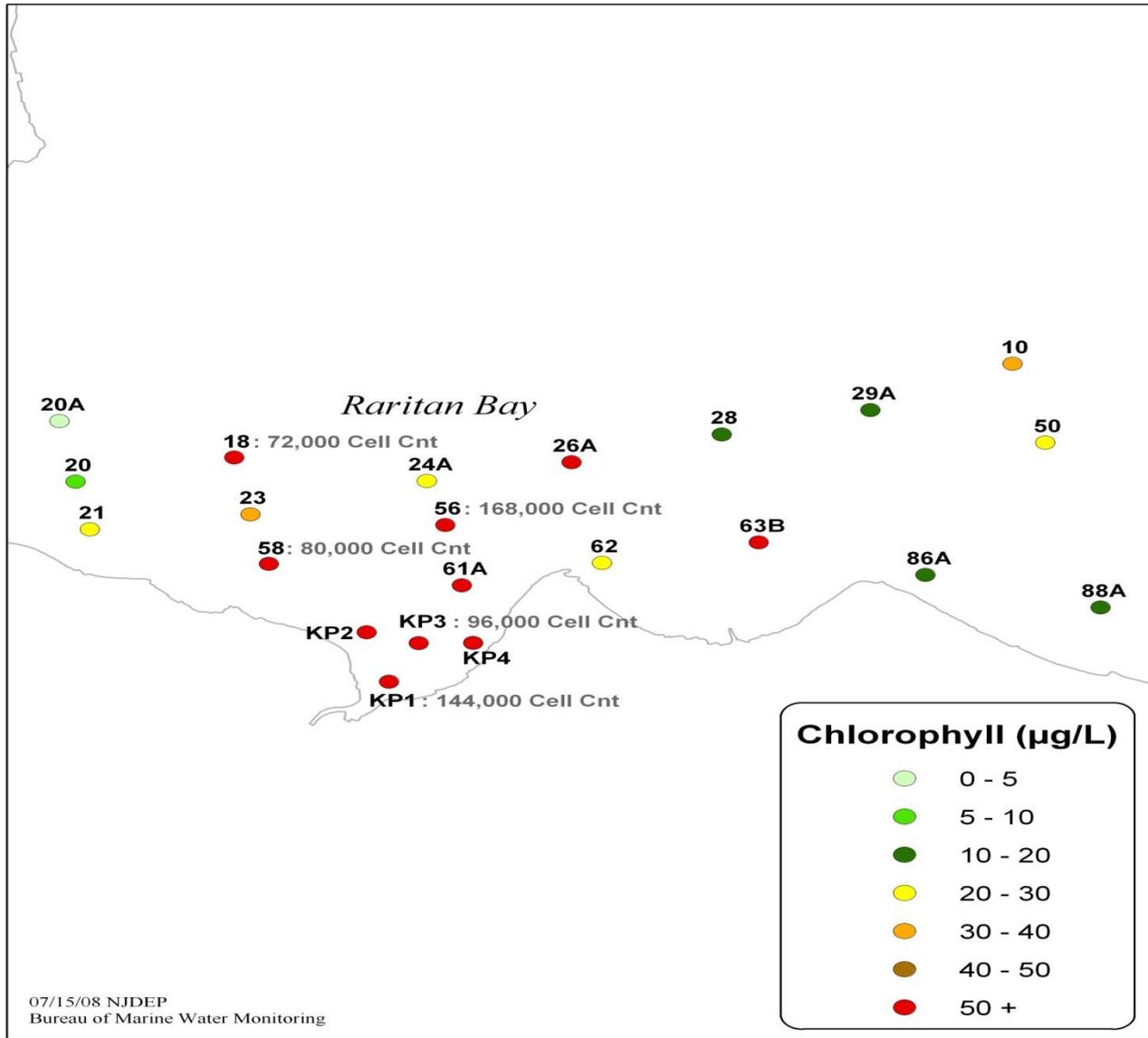
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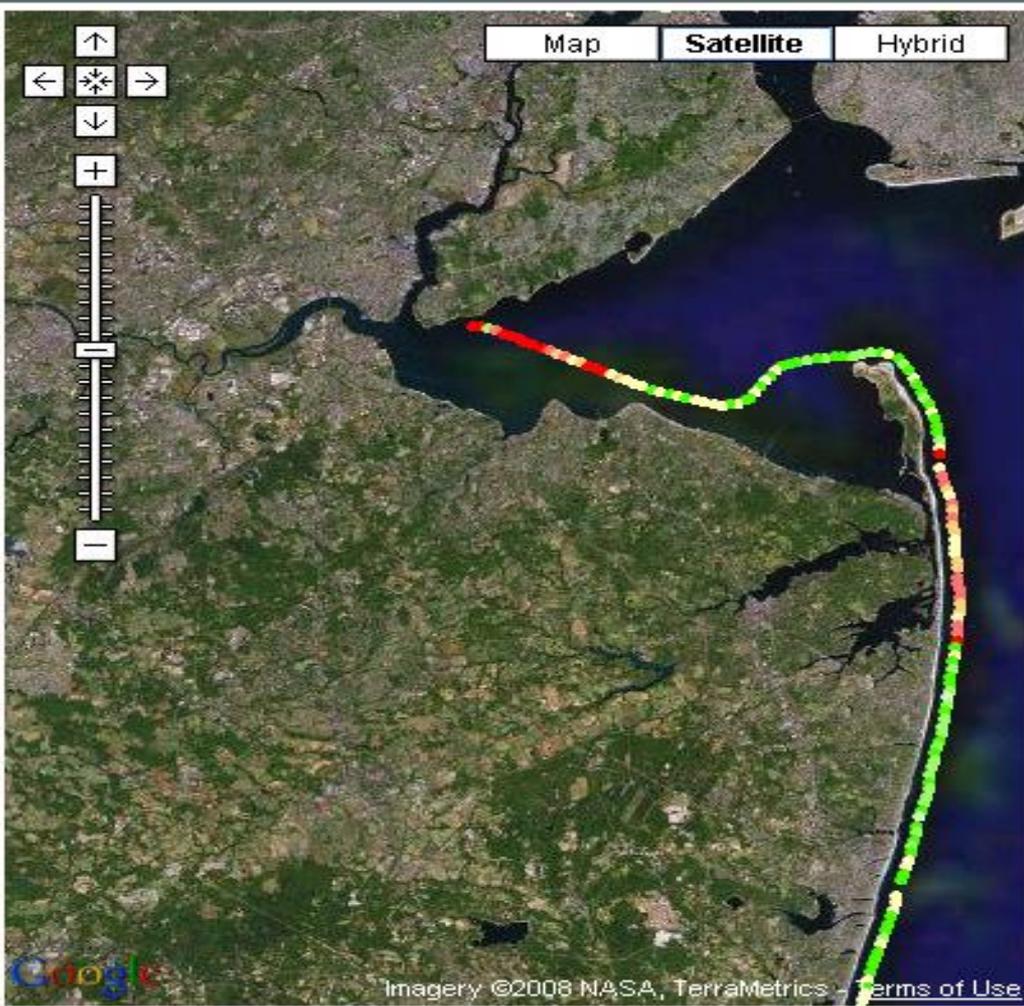
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Legend

Est. Chlorophyll
a ug/L

-  0-3
-  3-6
-  6-12
-  12-24
-  24-35
-  35-50
-  > 50





Date

(Year Month Day)

20080715 ▾

Legend

Est. Chlorophyll
a ug/L

- 0-3
- 3-6
- 6-12
- 12-24
- 24-35
- 35-50
- > 50



Date

(Year Month Day)

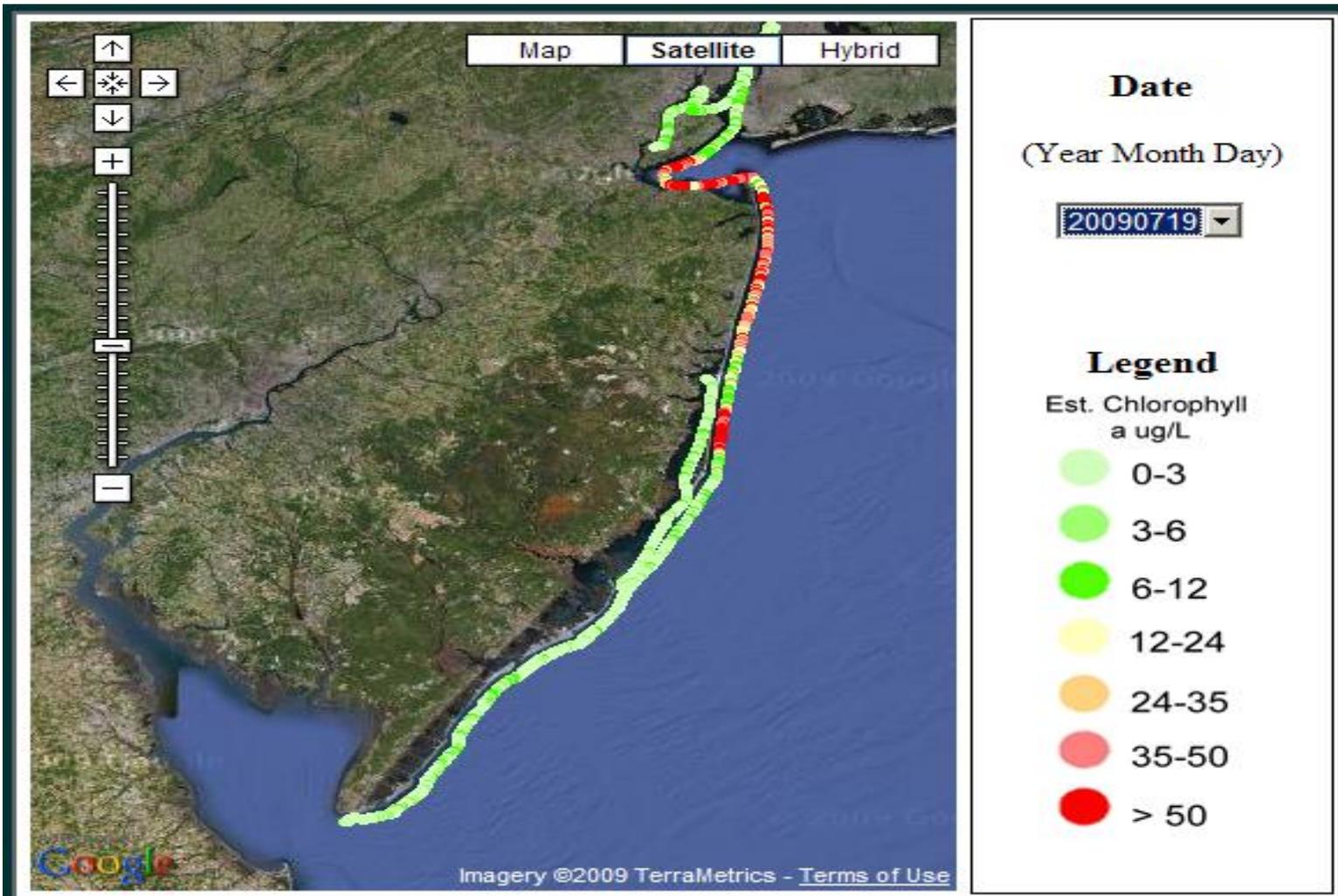
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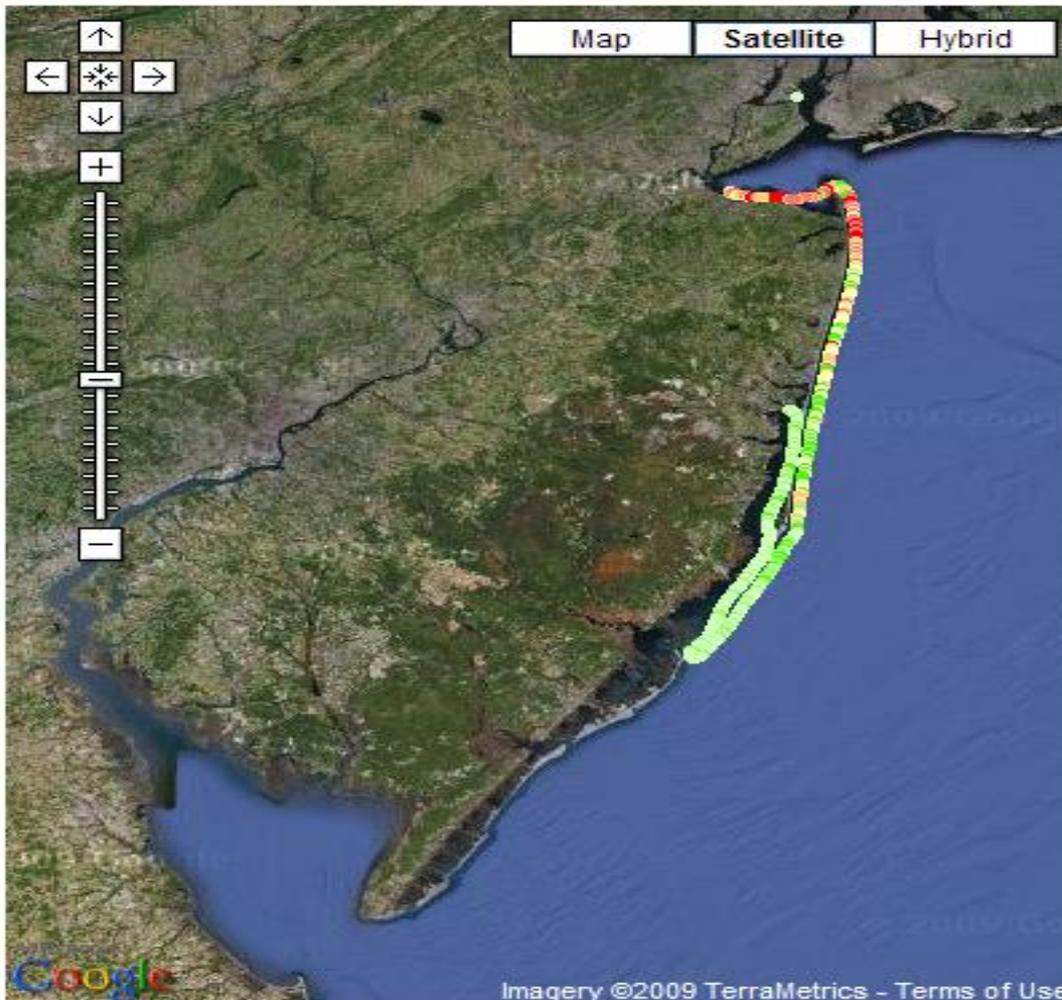
Legend

Est. Chlorophyll
a ug/L

- 0-3
- 3-6
- 6-12
- 12-24
- 24-35
- 35-50
- > 50

2009 Bloom





Map **Satellite** Hybrid

Date

(Year Month Day)

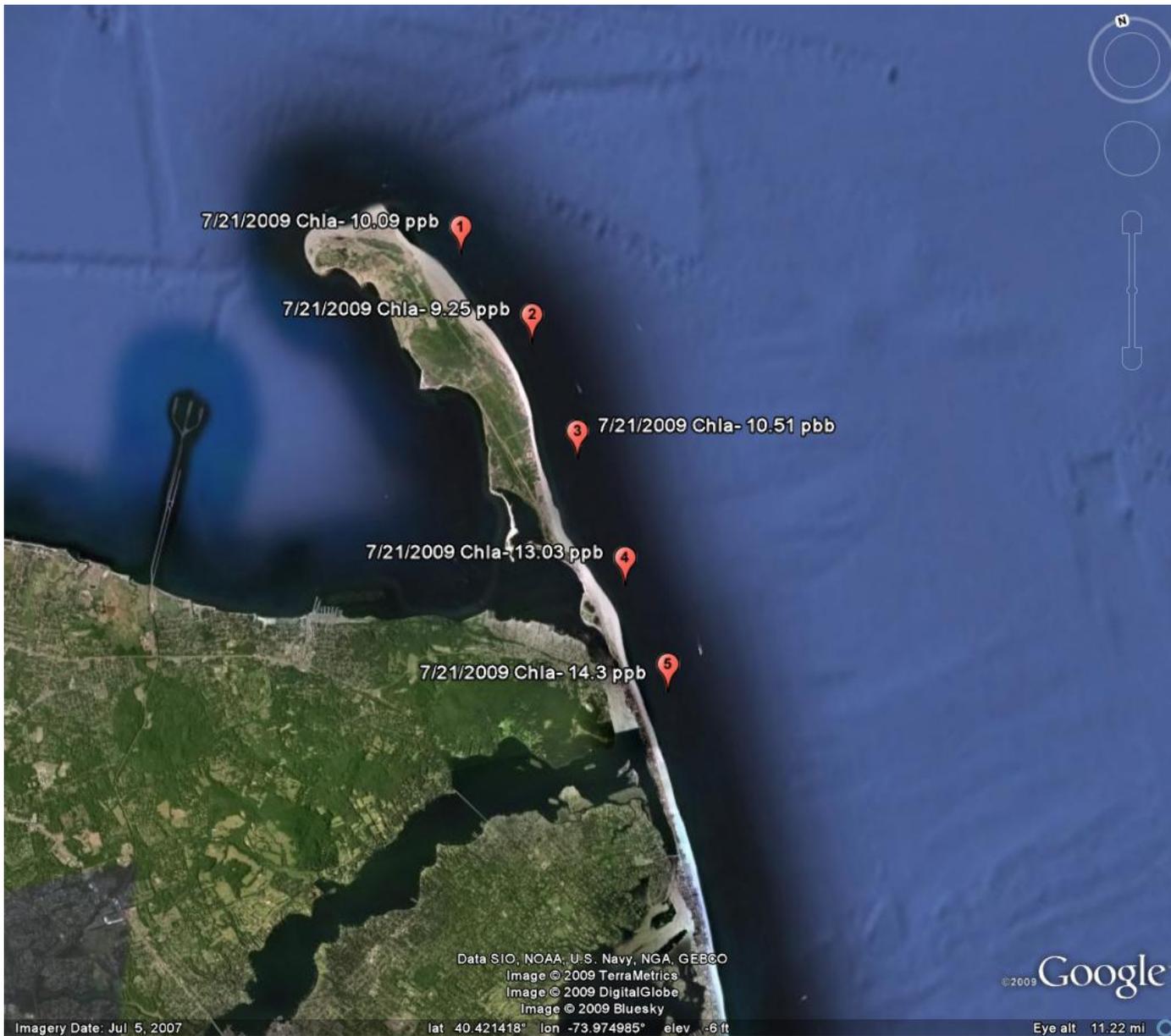
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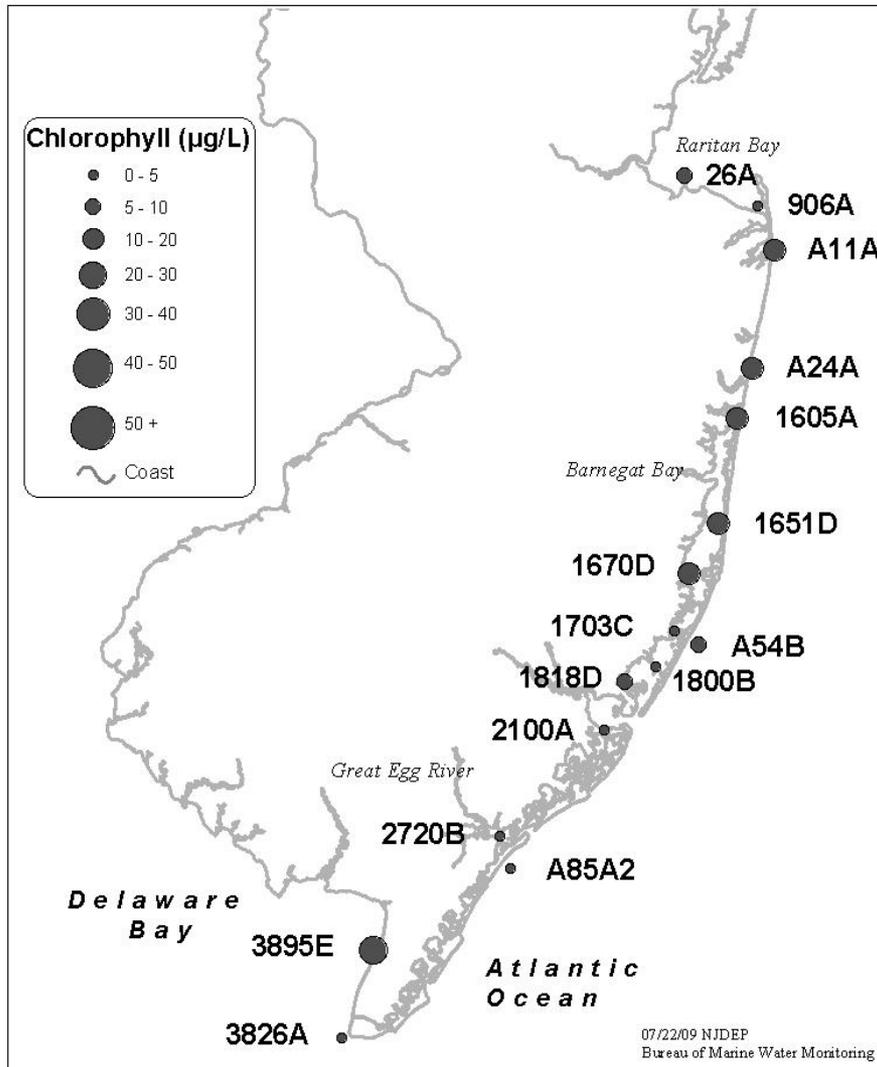
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Est. Chlorophyll
a ug/L

- 0-3
- 3-6
- 6-12
- 12-24
- 24-35
- 35-50
- > 50

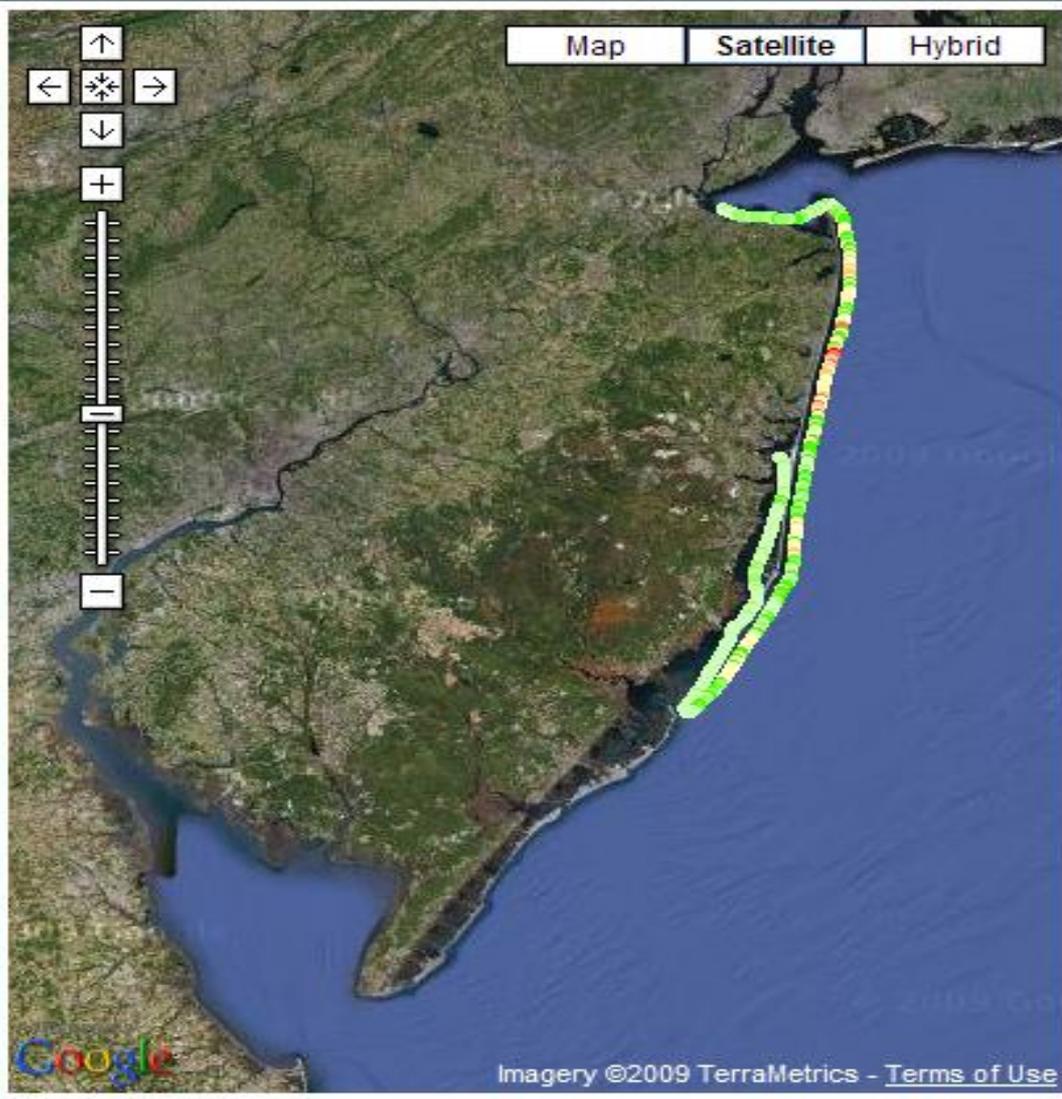






Sample Results 7/21+7/22

- Boat Samples collected on 7/21 and Samples collected for the Summer Phytoplankton Helicopter Monitoring (EPA) on 7/22, showed a bloom from Northern Monmouth County to Southern Ocean County.
- The bloom consisted of *Prorocentrum triestinum* and *Thalassiosira nordenskioldii*.
- Once identified the Remote sensing was used to monitor the status of the bloom.



Map Satellite Hybrid

Date

(Year Month Day)

20090724

Legend

Est. Chlorophyll
a ug/L

- 0-3
- 3-6
- 6-12
- 12-24
- 24-35
- 35-50
- > 50



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Date
(Year Month Day)
20090727

Legend
Est. Chlorophyll
a ug/L

- 0-3
- 3-6
- 6-12
- 12-24
- 24-35
- 35-50
- > 50

Algal Bloom Response (6/3/2011)

RUTGERS
New Jersey Agricultural
Experiment Station

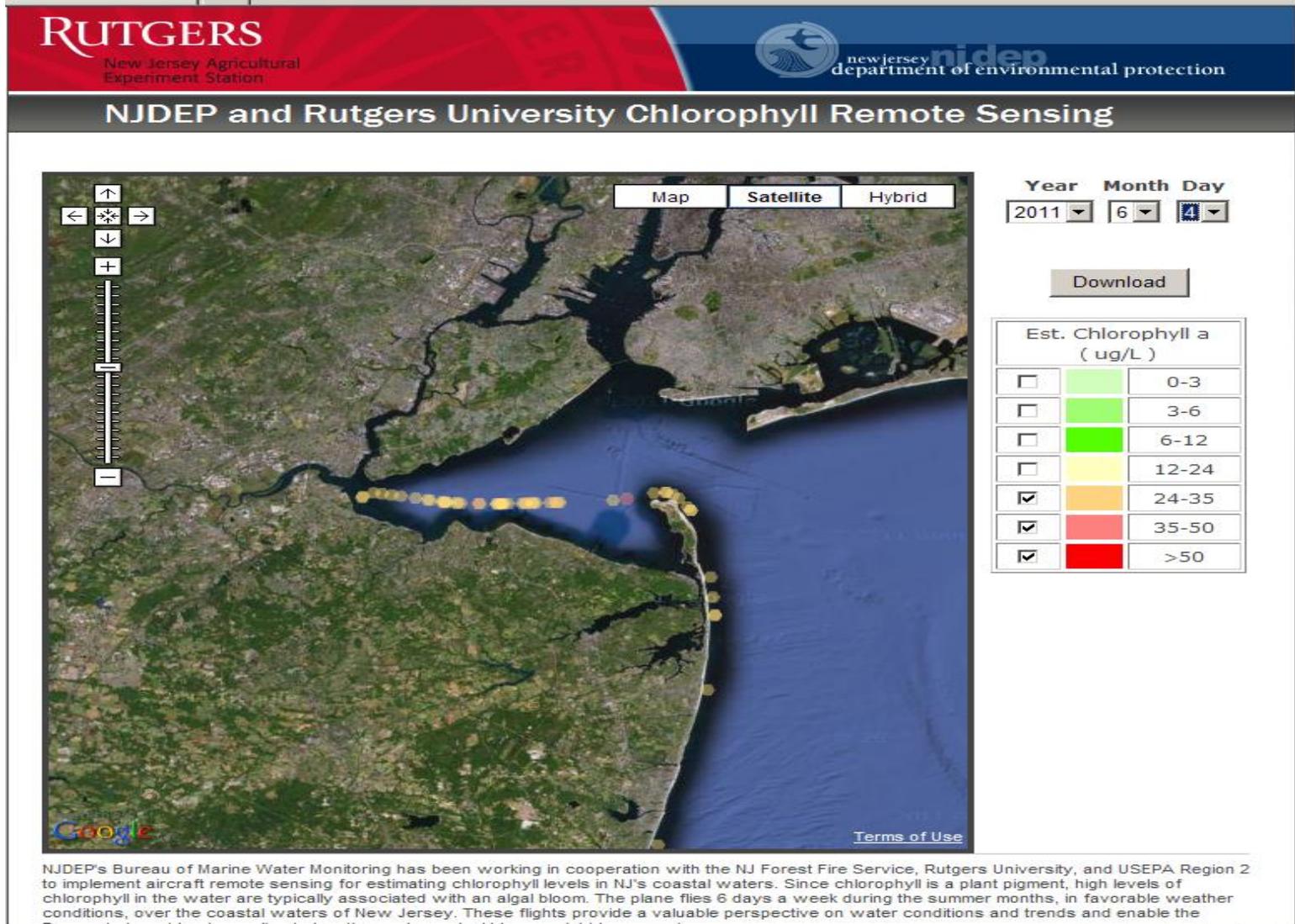
 new jersey **njdep**
department of environmental protection

NJDEP and Rutgers University Chlorophyll Remote Sensing

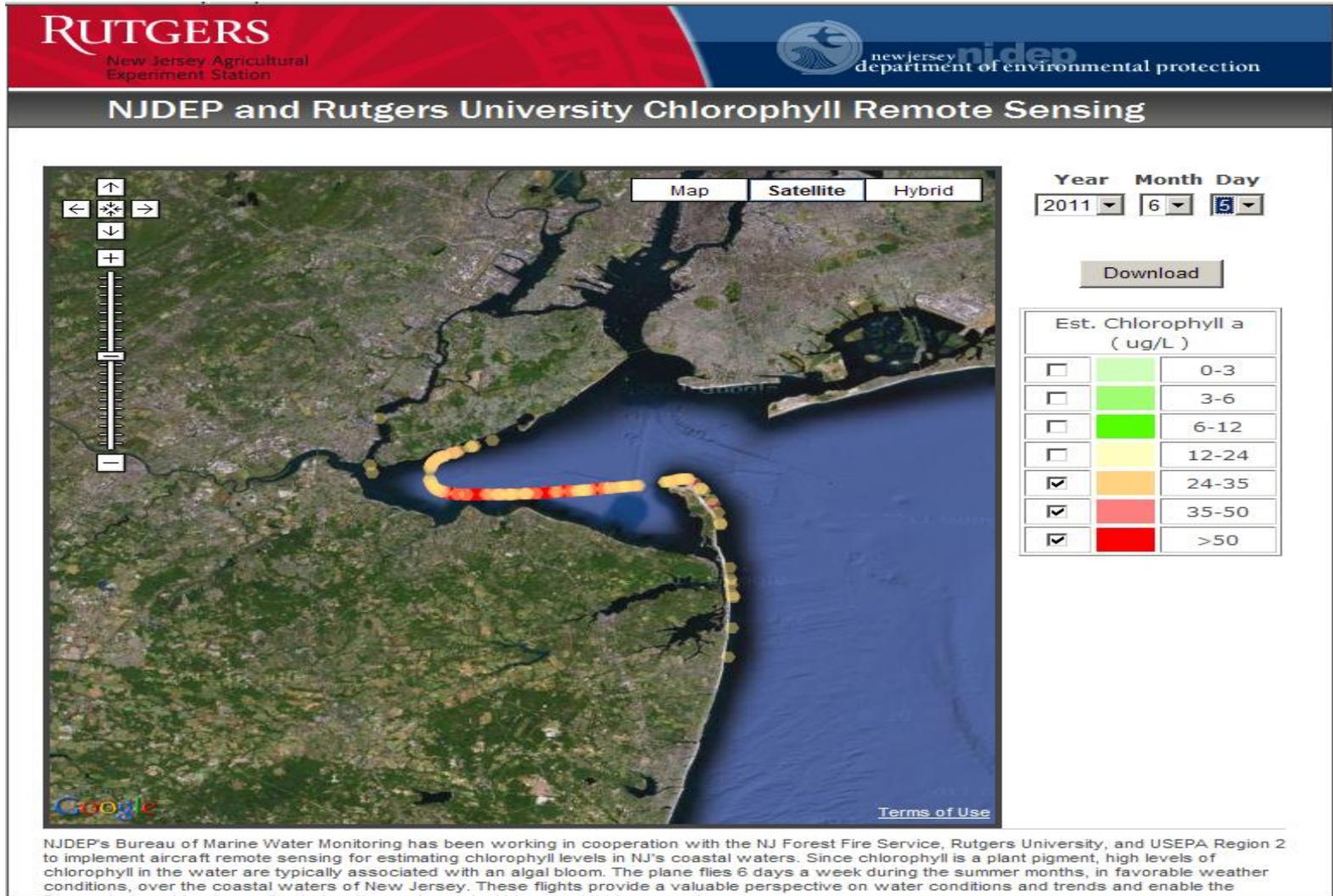


NJDEP's Bureau of Marine Water Monitoring has been working in cooperation with the NJ Forest Fire Service, Rutgers University, and USEPA Region 2 to implement aircraft remote sensing for estimating chlorophyll levels in NJ's coastal waters. Since chlorophyll is a plant pigment, high levels of chlorophyll in the water are typically associated with an algal bloom. The plane flies 6 days a week during the summer months, in favorable weather conditions, over the coastal waters of New Jersey. These flights provide a valuable perspective on water conditions and trends and enable the

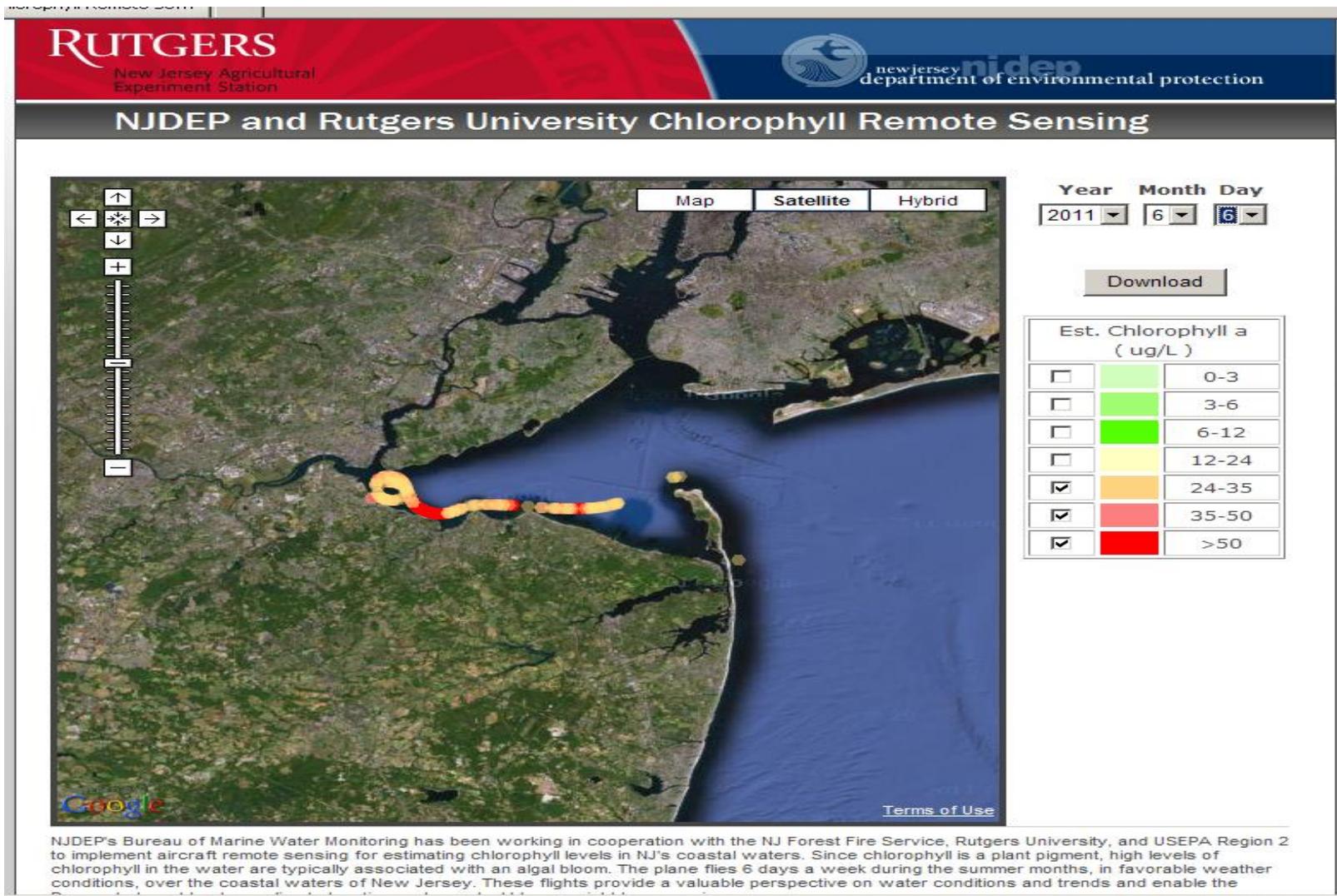
Algal Bloom Response (6/4/2011)



Algal Bloom Response (6/5/2011)



Algal Bloom Response (6/6/2011)

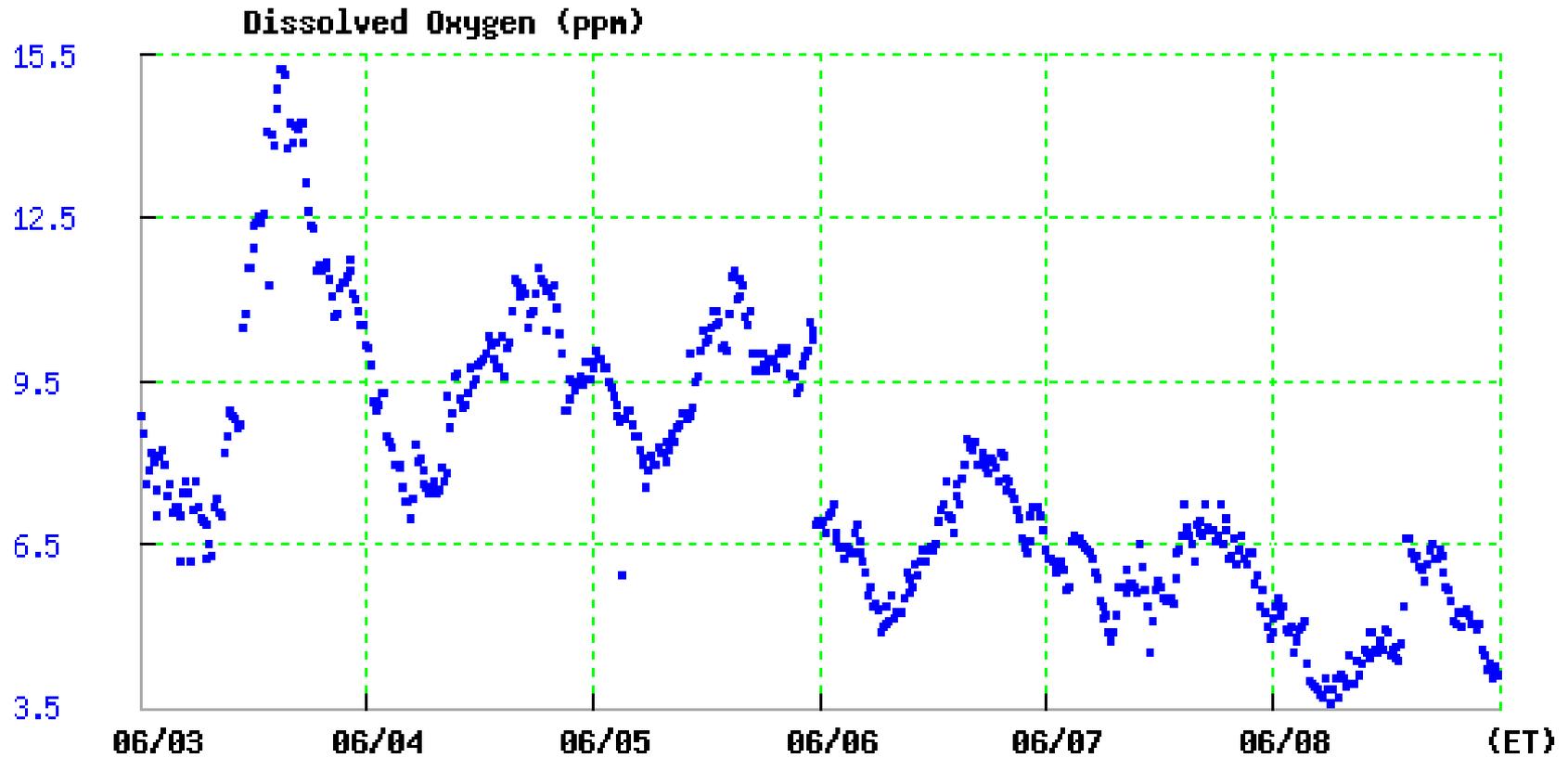


Sampling from Monday 6/6/2011

- Bloom still intense, samples collected, showed a large bloom of *Heterocapsa rotundata* (~ 1,240,000 cells/mL).
- *Heterocapsa rotundata* is a non-toxic dinoflagellate that is known to bloom in the late spring and cause the water to appear reddish in color.
- The bloom was most intense by the Keyport Harbor area.

Data Keyport Harbor

Keyport Yacht Club, Keyport Hbr, Raritan Bay, NJ(MUUCI)



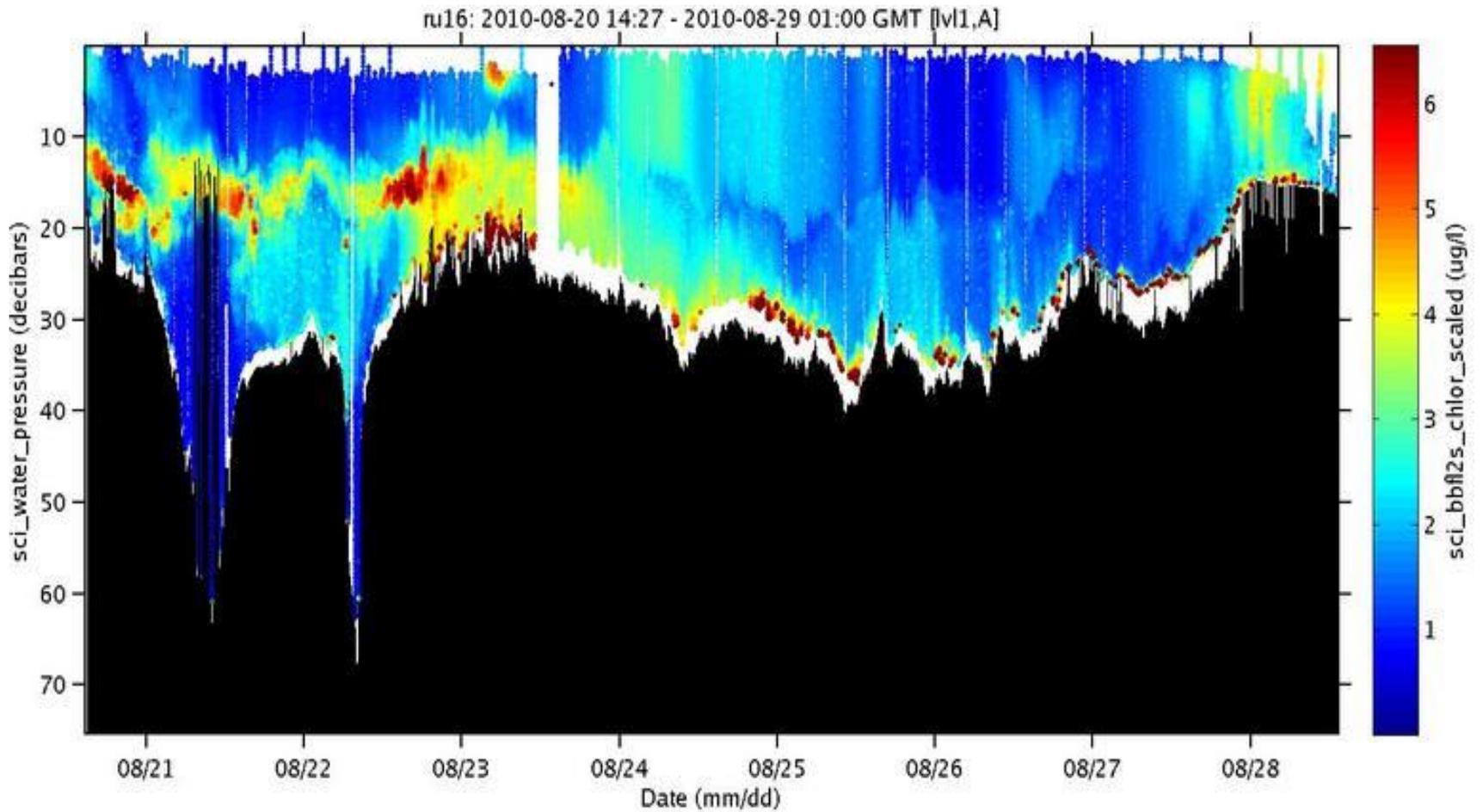
Fish Kill Reported 6/8/2011

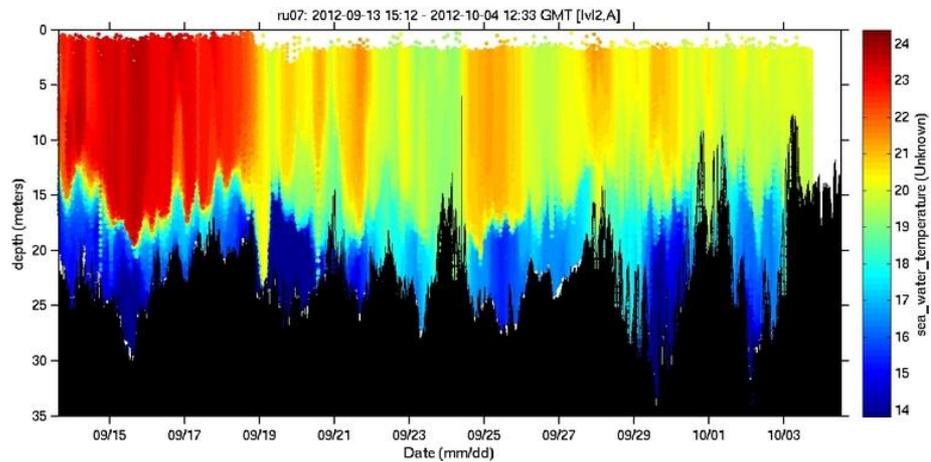
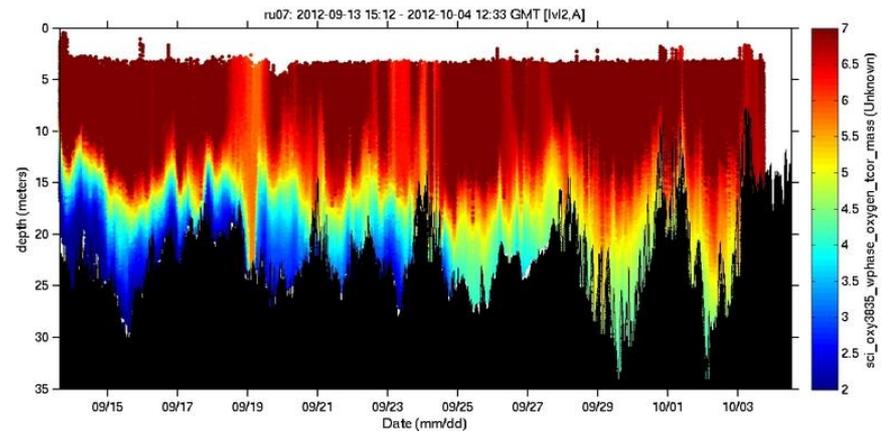
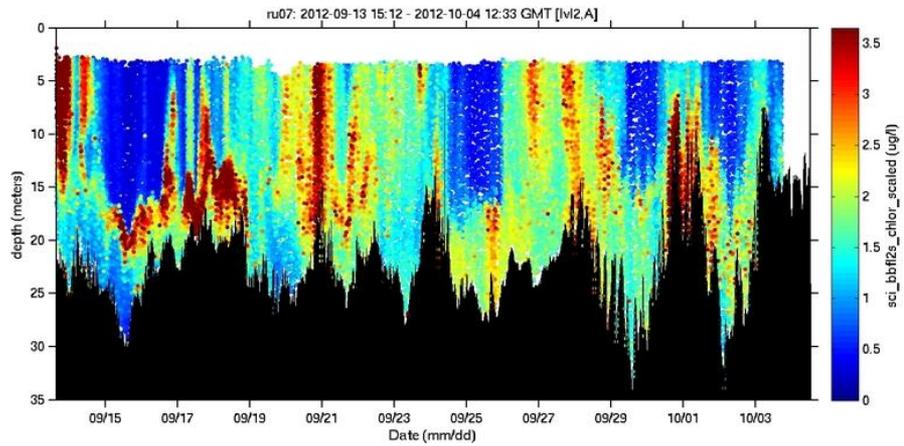
- Report of peanut bunker dead in the area of Keyport Harbor
- Already knew the cause of the fish kill
- In the past it was difficult to figure out what the cause was after the fact

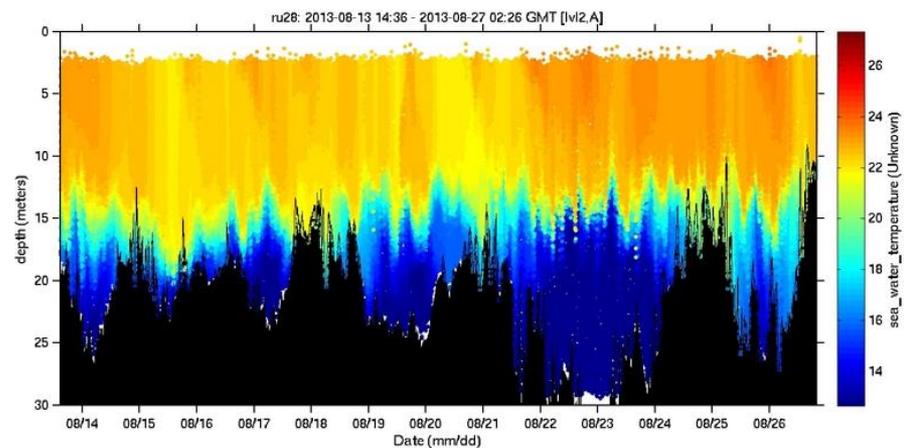
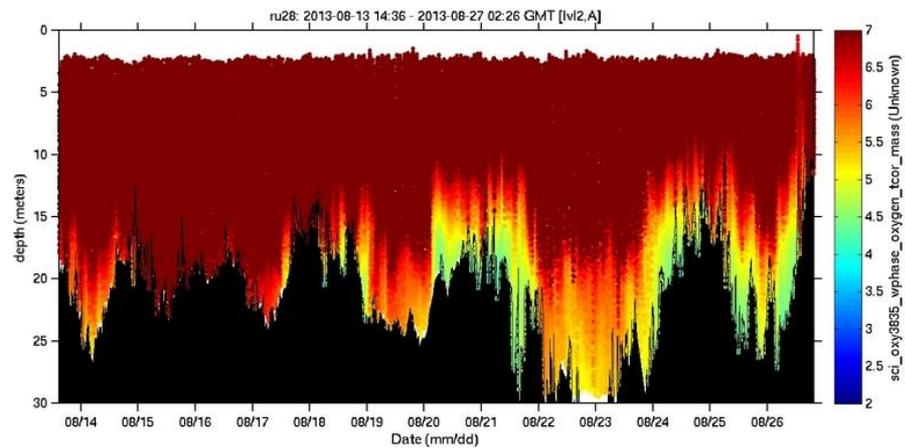
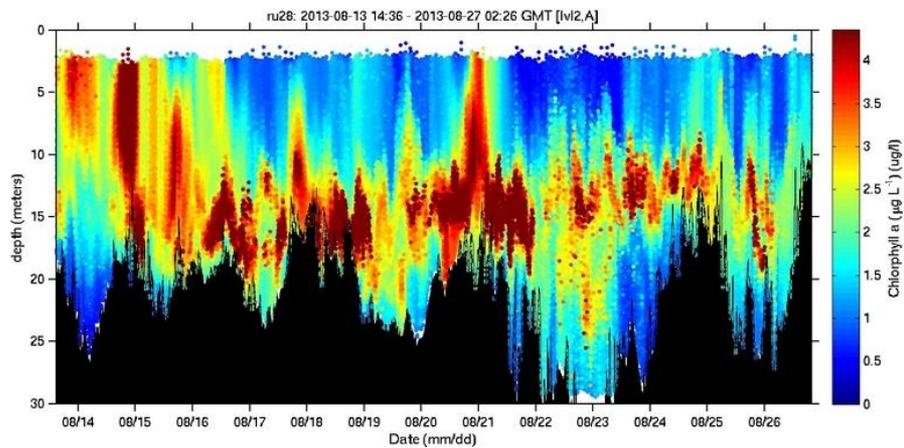
Slocum Glider

- A Joint effort with NJDEP, Rutgers U., and USEPA Region 2
- Can deploy glider for up to a month at a time
- Collects continuous data for dissolved oxygen, temperature, salinity, temperature, and chlorophyll a
- Helps to determine where an algal bloom might be in the water column
- Can be rerouted in the middle of its deployment

Chlorophyll a







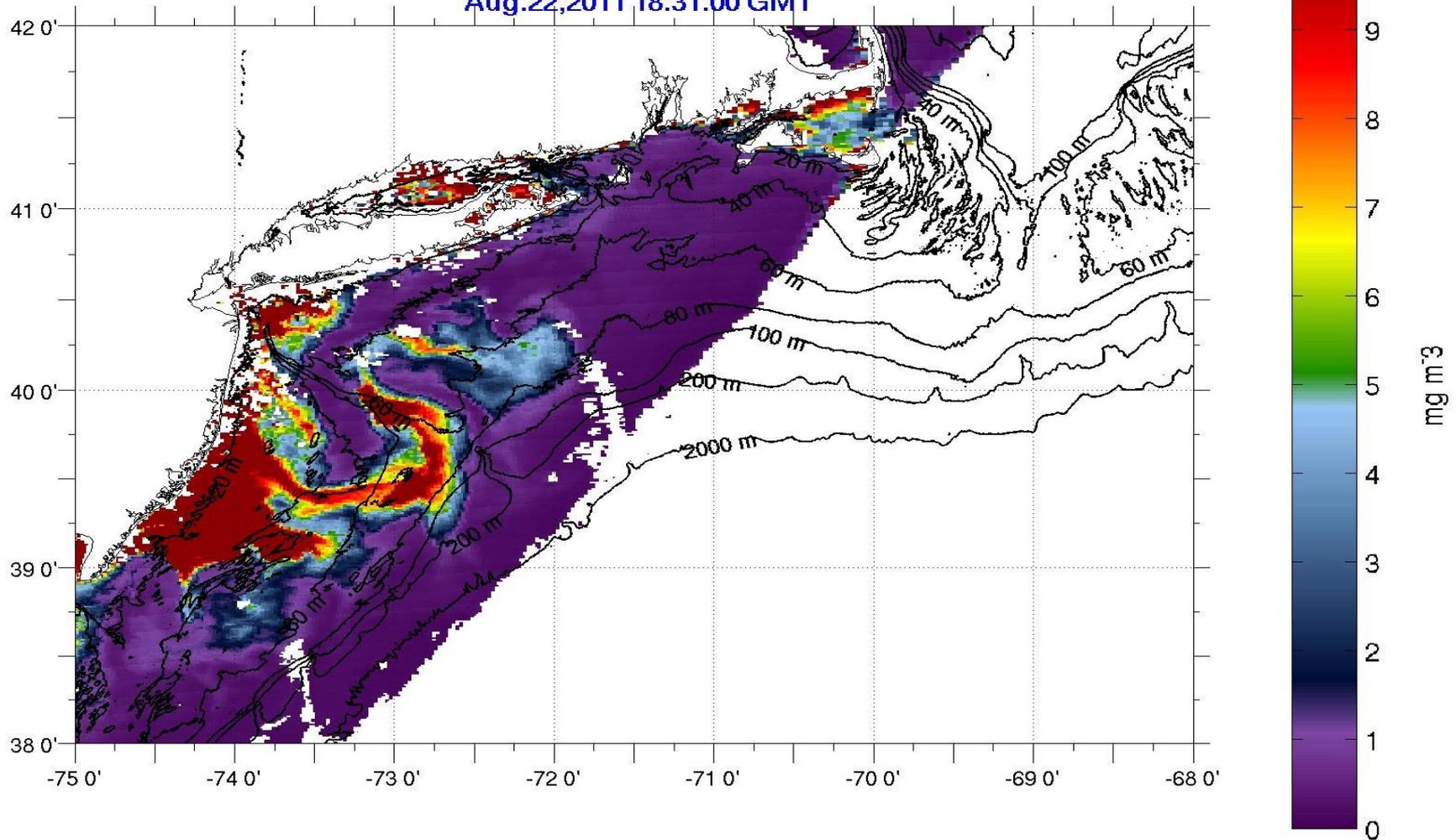
Deployment 8/10/11 - 9/9/11

- Started as a normal deployment to run from Long Branch to Cape May
- Rerouted to detect dissolved oxygen levels in a large bloom off the coast
- Rerouted again offshore during Hurricane Irene

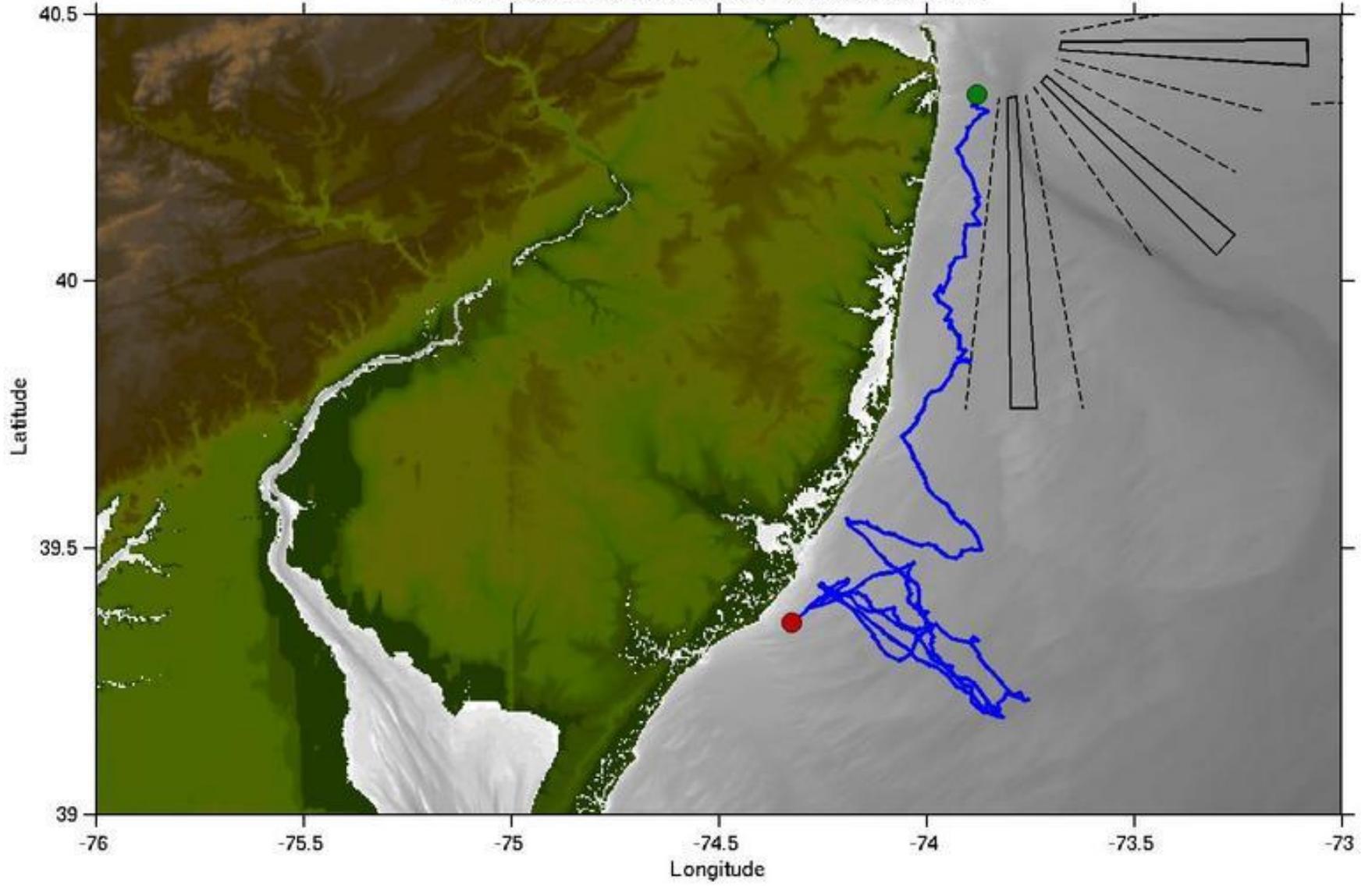
Satellite Imagery

RU COOL MODIS: Aqua Chlorophyll (OC3M)

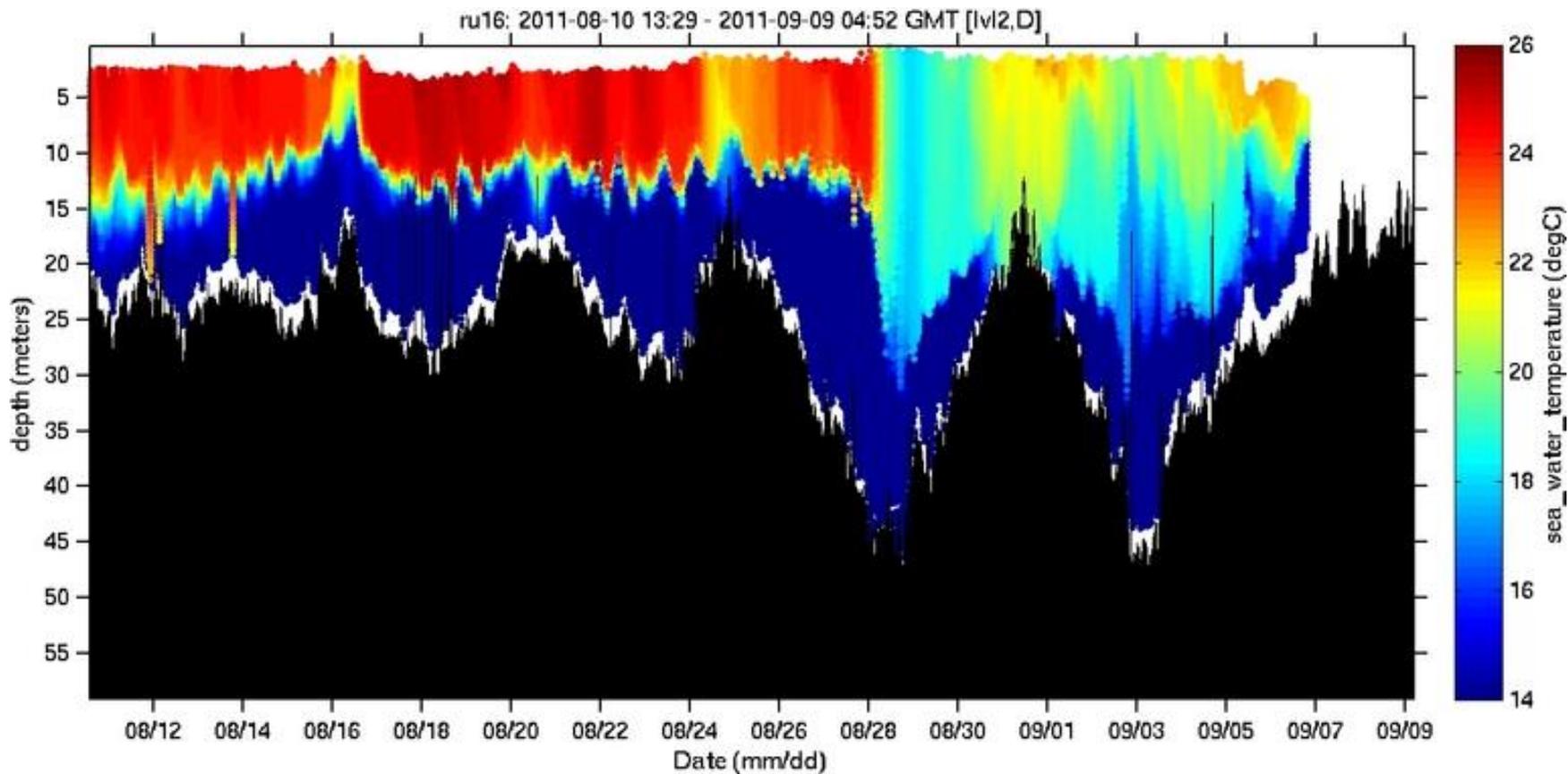
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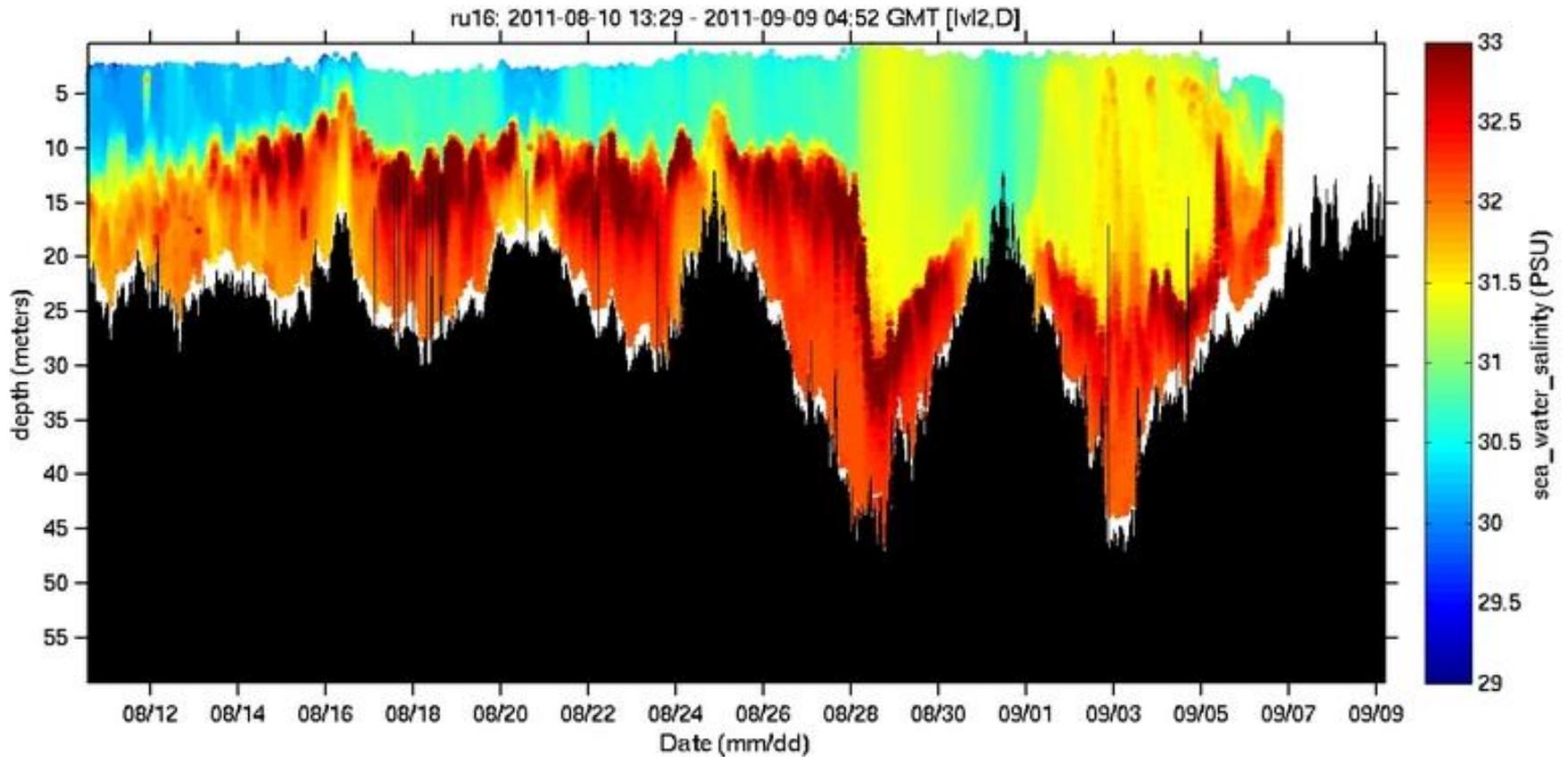
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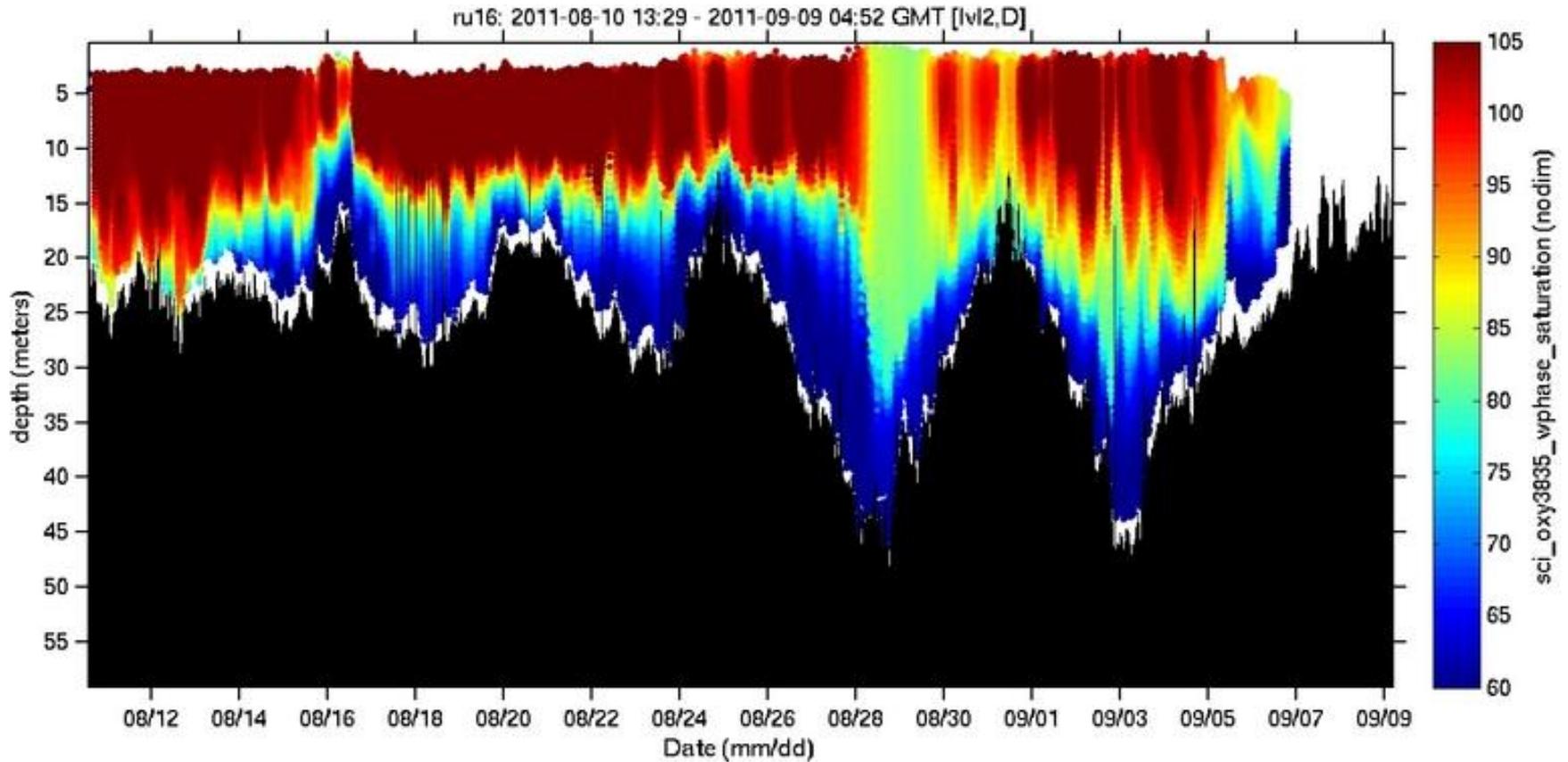
Temperature



Salinity



Oxygen Saturation



What Remote Sensing Allows us to do Better

- Quicker response to algal blooms.
- Identify target areas for phytoplankton species identification.
- Monitor the status, intensity and location of the algal bloom.
- Alert Officials and the Public of the potential for water discoloration or possible human health impacts in their coastal waters.