Biscayne Bay Phytoplankton Bloom - Summer 2013

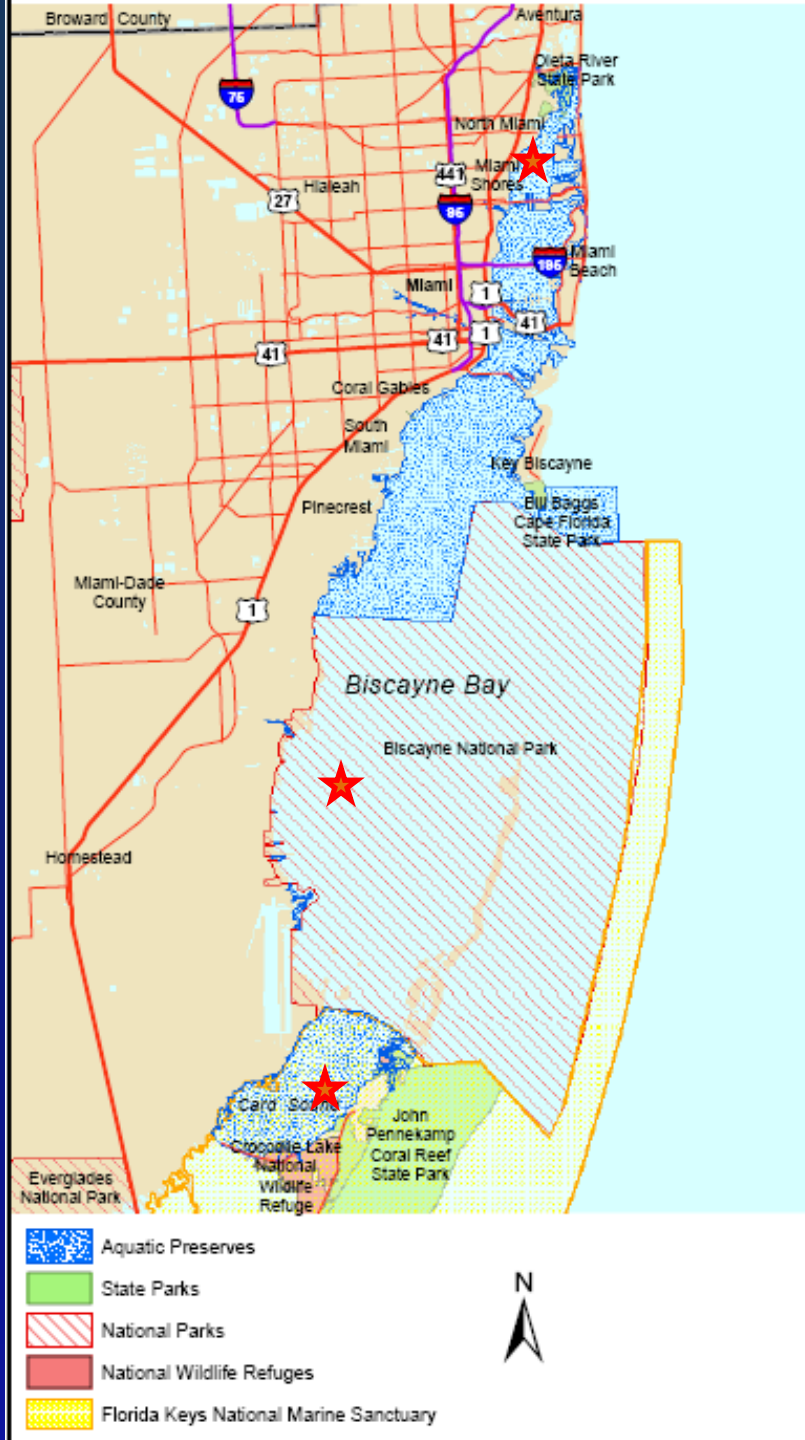
Water Quality Summary &
Observations on Spatial Extent
July 2013

Miami-Dade DERM

Thanks to: NPS-BNP, SFWMD, NOAA
Dr. Larry Brand, UM-RSMAS
Dr. Barry Rosen, USGS
FWC-FMRI
FIU

Initial Observations

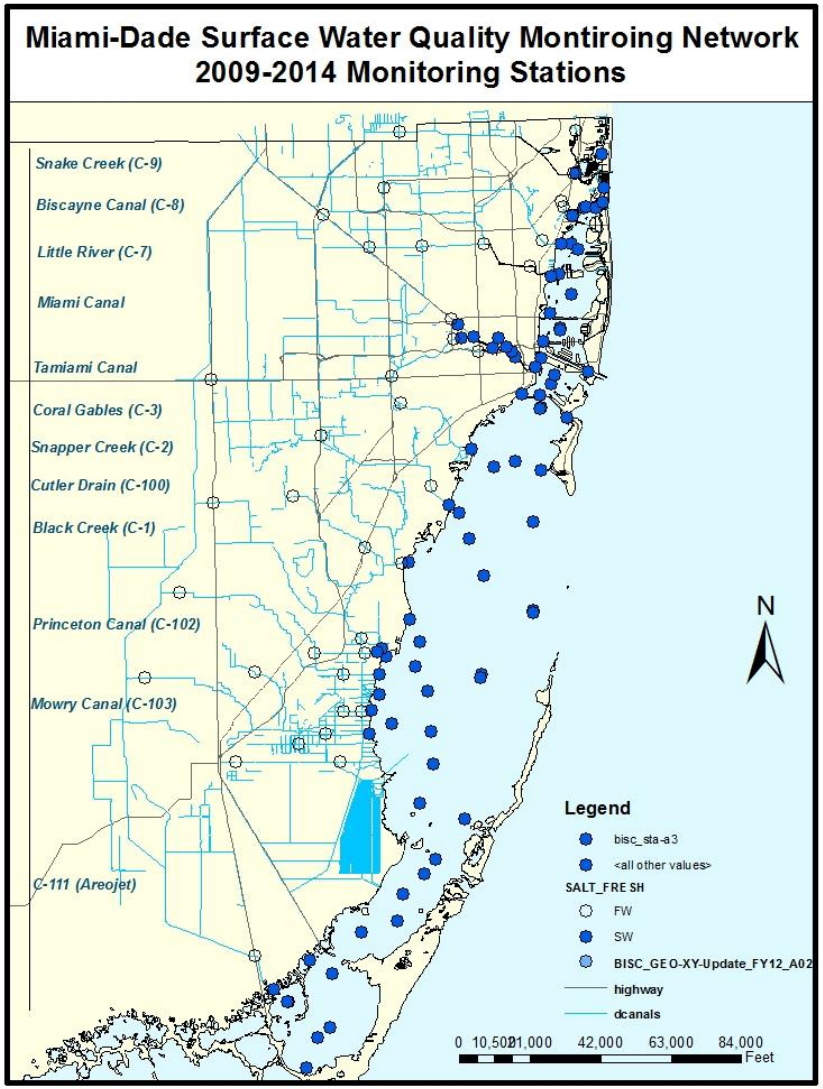
- In mid-June, field staff from BNP and other agencies reported areas of brown-colored, cloudy water and foul odors, especially in areas between Black Point and Convoy Point
- DERM reviewed June data from regular monthly sampling and noted elevated Chlorophyll (compared to “typical”) in Card Sound and locations in north Biscayne Bay.
- DERM collected a limited number of “special” samples (chla, sewage indicators, and selected nutrients) in south Biscayne Bay and recorded locations of discolored water on July 1, 2013 to help determine extent of bloom
- Samples of the bloom organisms were sent to experts at UM-RSMAS, FWC-FWRI, and USGS to identify the type of algae



Biscayne Bay Usually “clear”

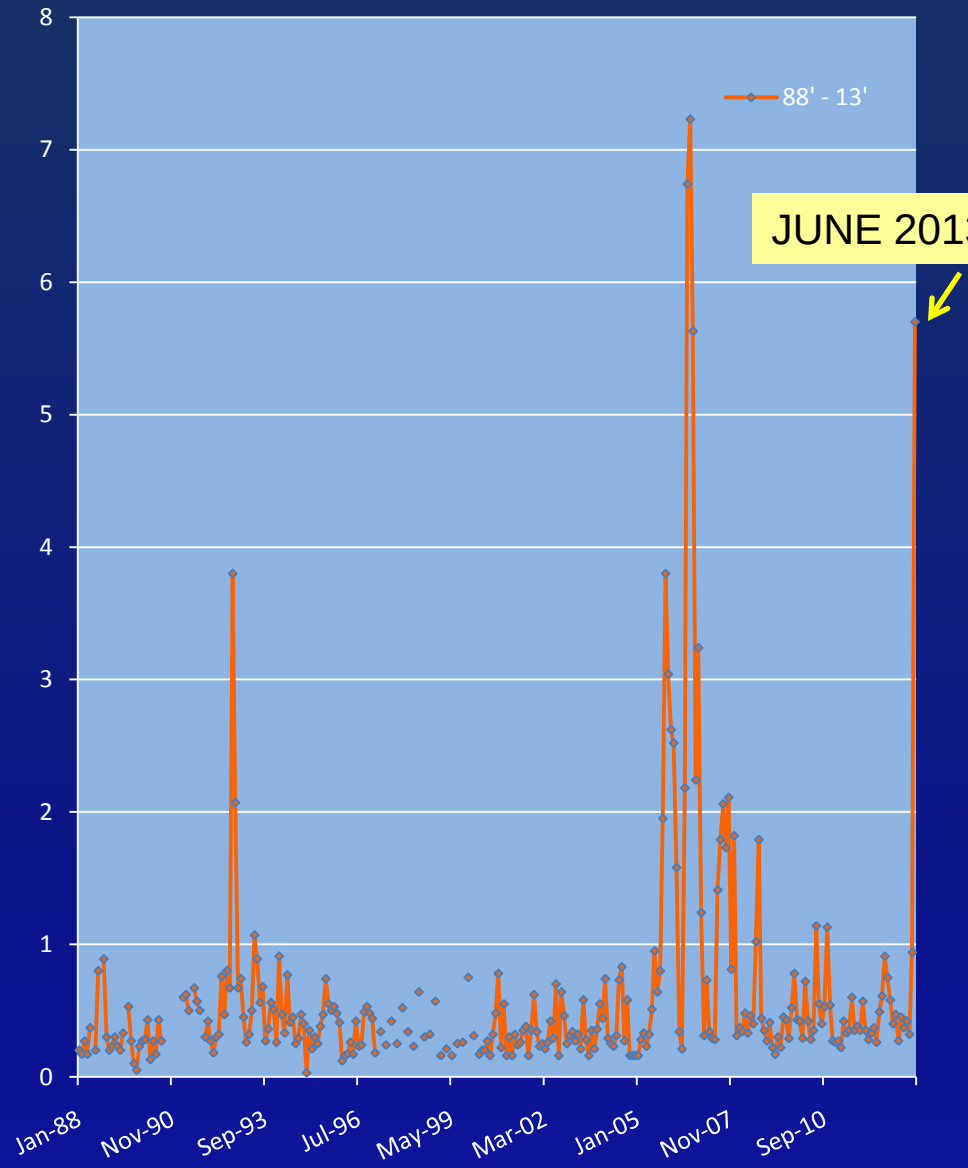
**Note: photos not taken at same location. Provided only for illustration.*

DERM Monthly Surface Water Quality Sampling Program

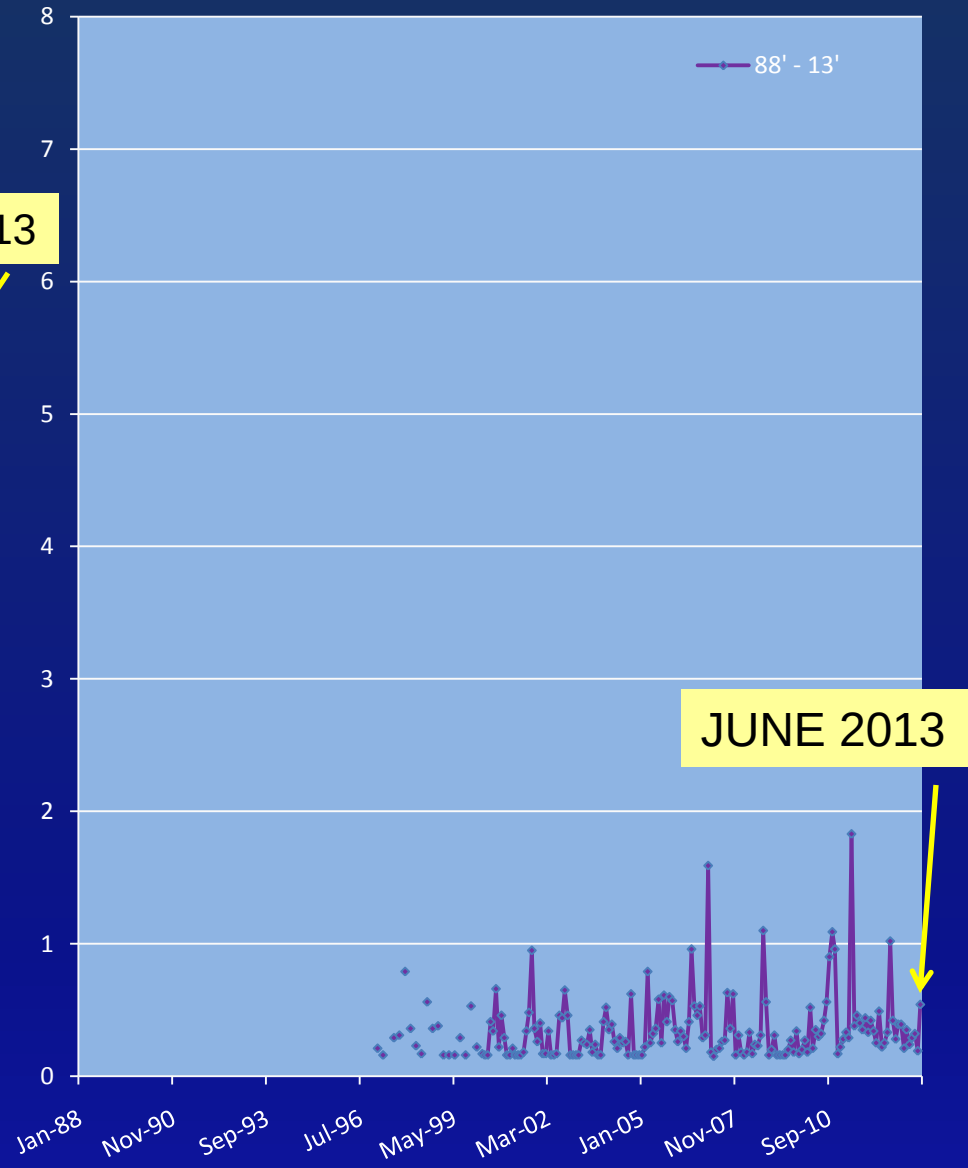


- Presently has 118 stations (68 'Bay'; 50 canal and tributaries)
- Provides information on large scale patterns and trends & meets needs of federal permits
- 47 Parameters assessed (Frequency varies)
- Physical, Physio-chemical
  - Light penetration (Bay only),Temp, pH, DO, Sal. conductivity, TSS, BOD, COD
- Nutrients
  - Ammonia, NOx, TP, OPO4, TKN
  - Chl-a (most Bay stations)
- Bacteria, Fecal Coliform

BB47 (Card Sound): 1/1988 - 06/2013
Chlorophyll-a (mg/m3)

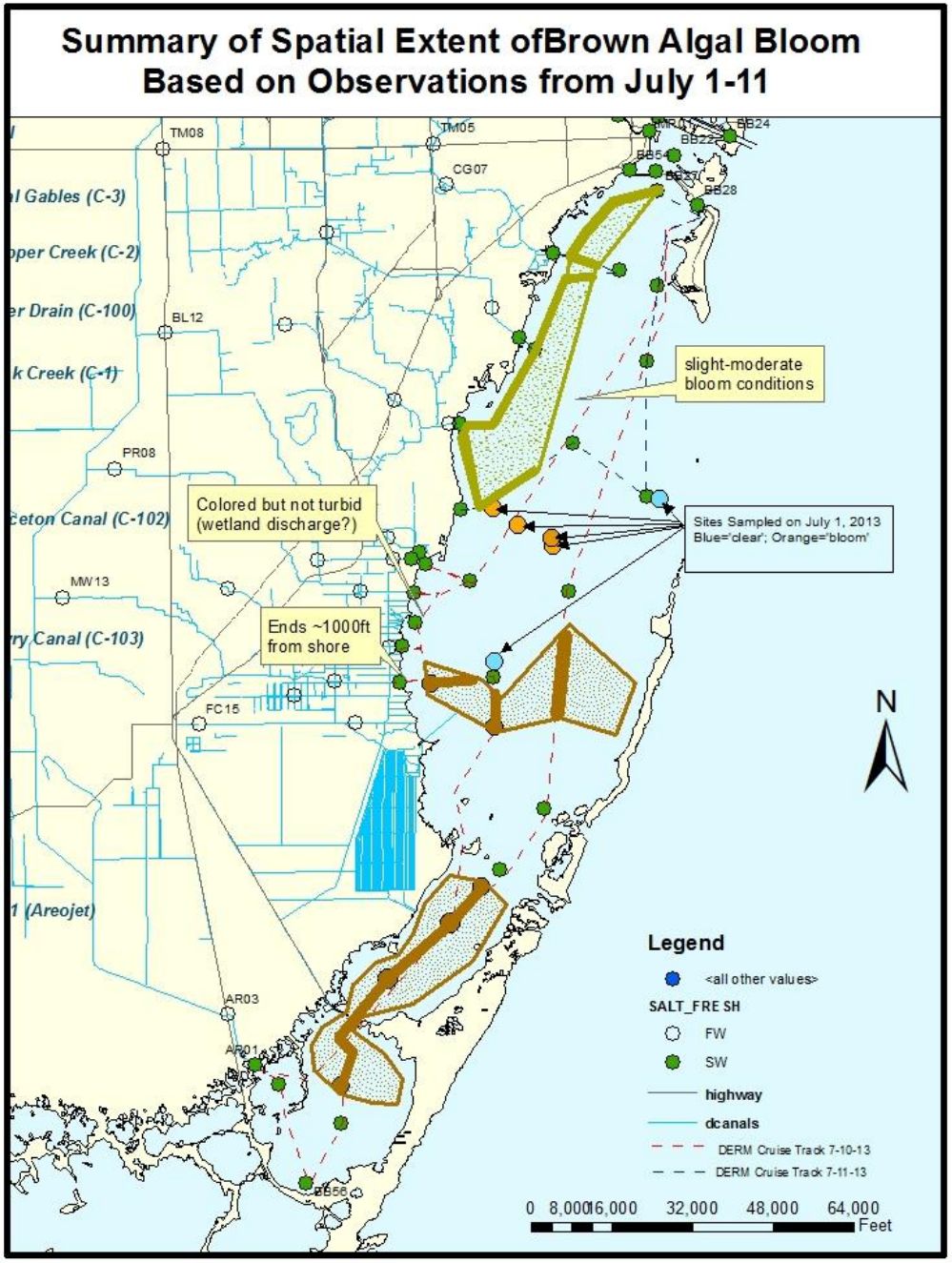


BB39A (mid Bay Black Creek): 1/1988 - 06/2013
Chlorophyll-a (mg/m3)



- Three large visible “patches” noted by DERM field crews while traveling from one sample station to another
  - Rickenbacker to south of Deering along western side
  - South central offshore of Convoy point to shoreline of Elliott
  - Arsenickers through Card and into northern Barnes Sound

- water samples collected outside patches (clear water) and in dense areas of patches



Summary of June 'South Bay' Water Quality & Preliminary Bloom Sampling

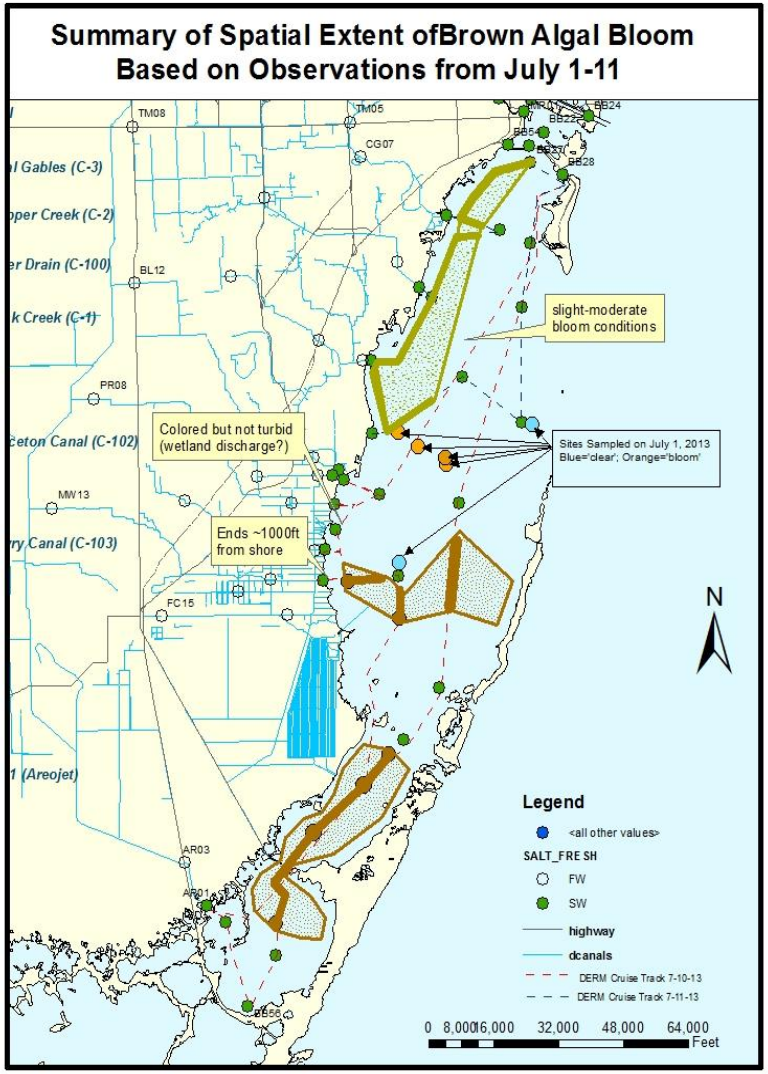
June WQ values 'normal', except Card Sound (BB47) Chl-a

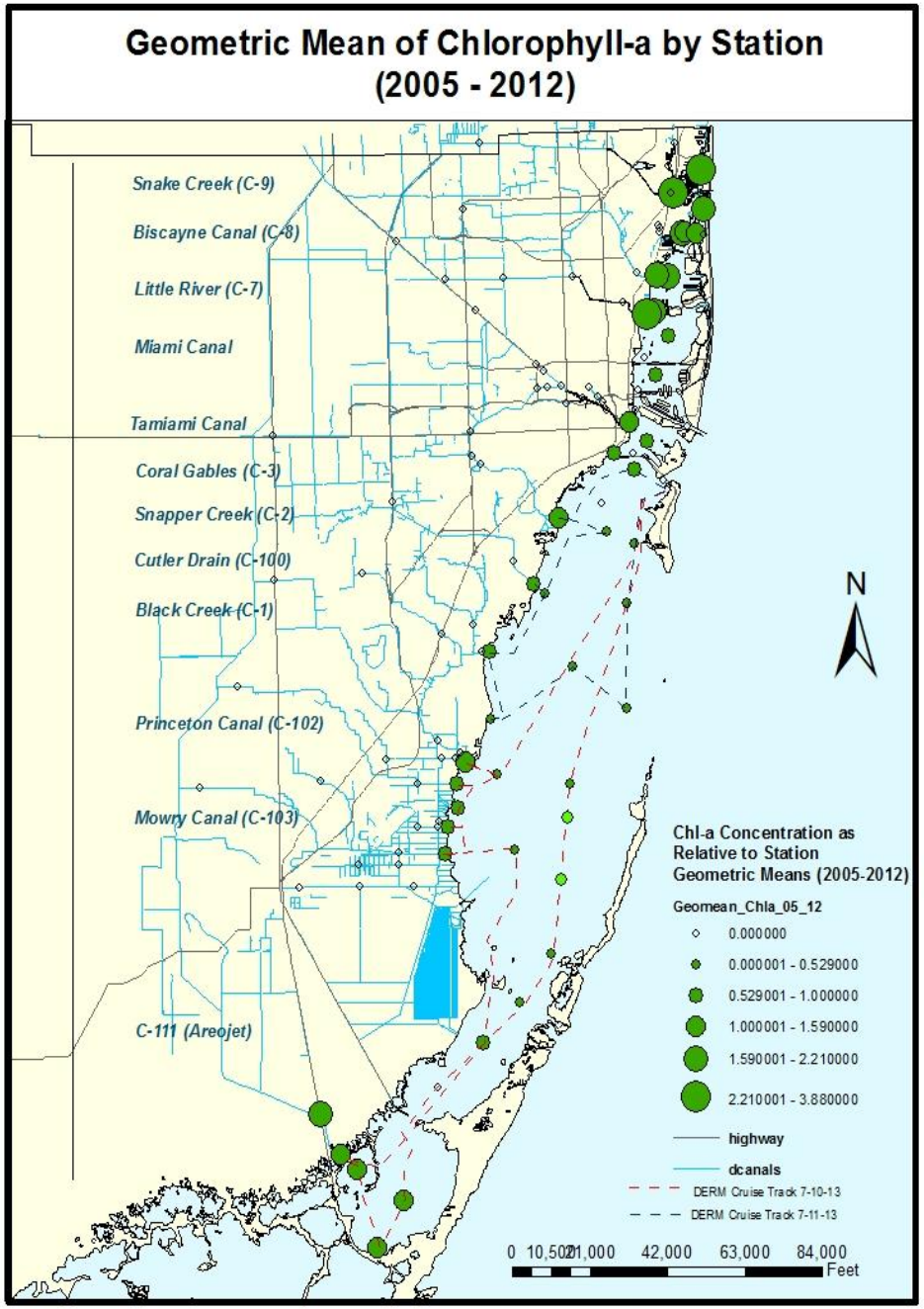
June Bay Run Sampling (June 5-6, 2013)

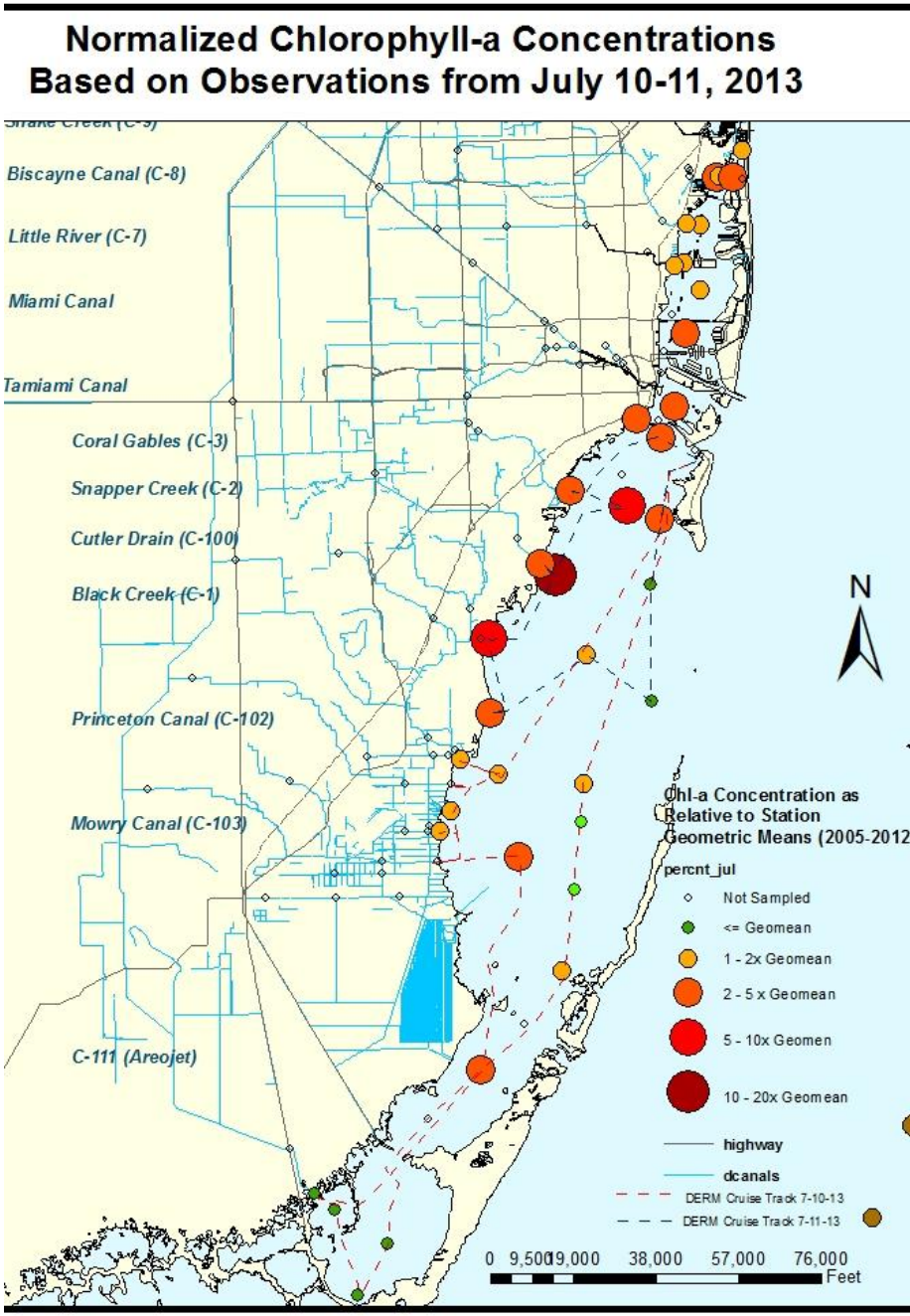
		Chl-a	TP	OPO4	TKN	Ammonia	Nox
MDL		0.16	0.002		0.08		0.01
Units		ug/l	mg/l		mg/l		mg/l
Stations	Nut-Seg						
BB27	NCO	0.23	0.004	U	U	0.09	U
BB31	NCI	U	U	U	U	0.09	U
BB35	SCO	U	U	U	U	0.10	U
BB36		U	U			0.09	U
BB37	SCo	U	U	U	U	0.09	U
BB38	NCI	0.38	0.003	U	U	0.09	U
BB39A	SCI	0.54	0.003	U	0.49	0.10	0.20
BB41	SCM	0.55	0.002	U	0.18	0.10	0.02
BB44	SCO	0.47	0.002	0.002	0.13	0.09	U
BB47	CS	5.70	0.004	0.003	0.26	0.09	U
BB50	BSMB	1.24	0.006	0.002	0.16	0.11	U
BB51	BSMB	0.82	0.003	U	0.40	0.11	U
BB52	SCI	0.17	0.003	0.003	0.13	0.02	0.17
BB53	SCI	0.98	0.004	0.004	0.63	0.12	1.00
BB54	SNB	2.47	0.004	U	0.10	0.09	U
BB56	BSMB	1.37	0.006	U	0.52	0.13	U

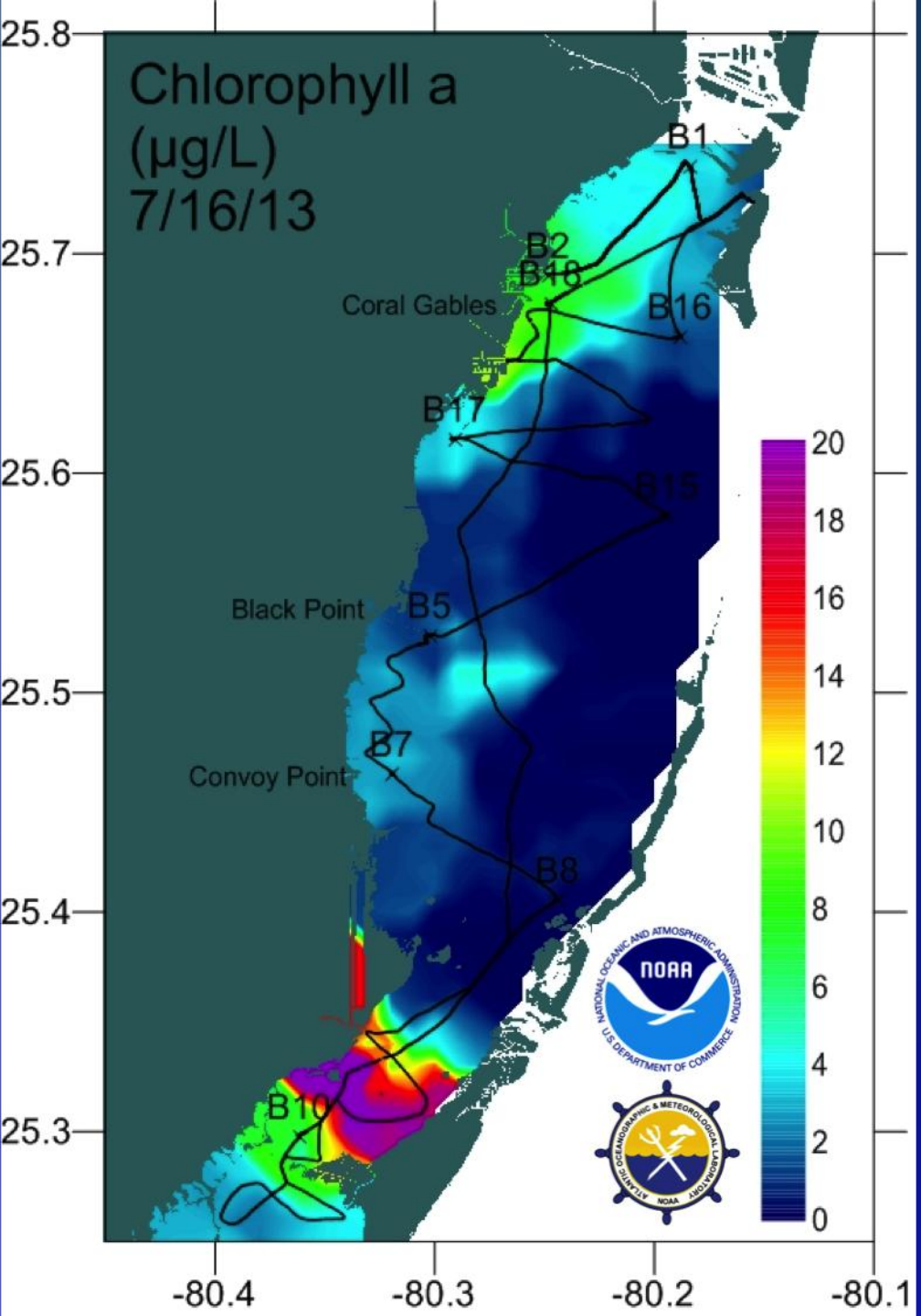
July 1, 2013 - opprotunistic sampling outside (BE1, BE2) & inside (BE3, BE4, BE5, BE6) the bloom

		Chl-a	TP	OPO4	TKN	Ammonia	Nox	Sulfate	Color	Fecal Coliform	Enterococcus
MDL		0.16	0.002	0.002	0.08	0.01	0.01	0	5	10	10
Units		ug/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	PCU	cfu/100ml	cfu/100ml
Stations	Nut-Seg										
BE1	SCM	0.4	0.002	0.003	<0.08	0.1	<0.01	2760	8	<10	<10
BE2	SCO	0.42	0.002	0.003	<0.08	0.08	<0.02	2700	15	<10	<10
BE3	SCO	9.63	0.028	<0.002	0.85	0.07	<0.03	2470	25	<10	<10
BE4	SCM	5.27	0.008	0.003	0.31	0.08	<0.04	2650	20	<10	<10
BE5	SCO	11.11	0.016	<0.002	0.67	0.08	<0.05	2640	30	<10	<10
BE6	SCI-SCM	11.94	0.022	<0.002	1.07	0.07	<0.06	2460	35	<10	<10




Geometric Mean of Chlorophyll-a by Station
(2005 - 2012)
Snake Creek (C-9)
Biscayne Canal (C-8)
Little River (C-7)
Miami Canal
Tamiami Canal
Coral Gables (C-3)
Snapper Creek (C-2)
Cutler Drain (C-100)
Black Creek (C-1)
Princeton Canal (C-102)
Mowry Canal (C-103)
C-111 (Areojet)
N
Chl-a Concentration as
Relative to Station
Geometric Means (2005-2012)
Geomean_Chla_05_12
0.000000
0.000001 - 0.529000
0.529001 - 1.000000
1.000001 - 1.590000
1.590001 - 2.210000
2.210001 - 3.880000
highway
dcanals
DERM Cruise Track 7-10-13
DERM Cruise Track 7-11-13
0 10,500 21,000 42,000 63,000 84,000
Feet


Normalized Chlorophyll-a Concentrations
Based on Observations from July 10-11, 2013
Biscayne Canal (C-8)
Little River (C-7)
Miami Canal
Tamiami Canal
Coral Gables (C-3)
Snapper Creek (C-2)
Cutler Drain (C-100)
Black Creek (C-1)
Princeton Canal (C-102)
Mowry Canal (C-103)
C-111 (Areojet)
N
Chl-a Concentration as
Relative to Station
Geometric Means (2005-2012
percnt_jul
Not Sampled
<= Geomean
1 - 2x Geomean
2 - 5 x Geomean
5 - 10x Geomen
10 - 20x Geomean
highway
dcanals
DERM Cruise Track 7-10-13
DERM Cruise Track 7-11-13
0 9,500 19,000 38,000 57,000 76,000
Feet



NOAA Survey Results

- "typical" concentrations ~ 1 ug/L
- survey track was not able to reach eastern part of south Biscayne Bay

Preliminary Findings

- In samples examined to date, algae are common marine diatoms. Typically, these algae do not produce toxins. Additional samples will be examined to look for changes in the species composition.
- Bloom is widespread, from N-S and E-W, but is patchy. Some areas appear clear (normal), but others contain concentrations of Chl 2-50X higher than typical "healthy" conditions. Location of clear and dense patches changes. Currents? Growth? Decline?
- Some locations tested have higher than usual total phosphate.
- Tests for sewage indicator bacteria were all negative, as were ammonia concentrations and other forms of nitrogen.
- SFWMD analysis shows early onset of rainy season may be contributing higher than usual volumes of canal flow across the watershed.
- Source of odor not known, but may be decomposition of organic matter or low O2 levels.
- Causes of bloom remain unknown, but point sources such as sewage spills or landfills unlikely because the bloom is widespread and associated more with marine salinity. May be combination of human related and other factors.

What next?

- Important to remain vigilant. The condition is not “normal”, but so far has not had human health effects. This could change, or there may be ecological effects.
- Federal, state and local agencies and university scientists collaborating to optimize response and cost-savings (no budget surpluses).
- NOAA-AOML conducting continuous sampling transects this week, which will help make a more thorough map of bloom pattern.
- Another set of baywide DERM samples under analysis now.
- More samples being sent to experts for identification, testing for chemical toxins.