# Algae in the Albemarle Sound: 2000-2015

Elizabeth Fensin

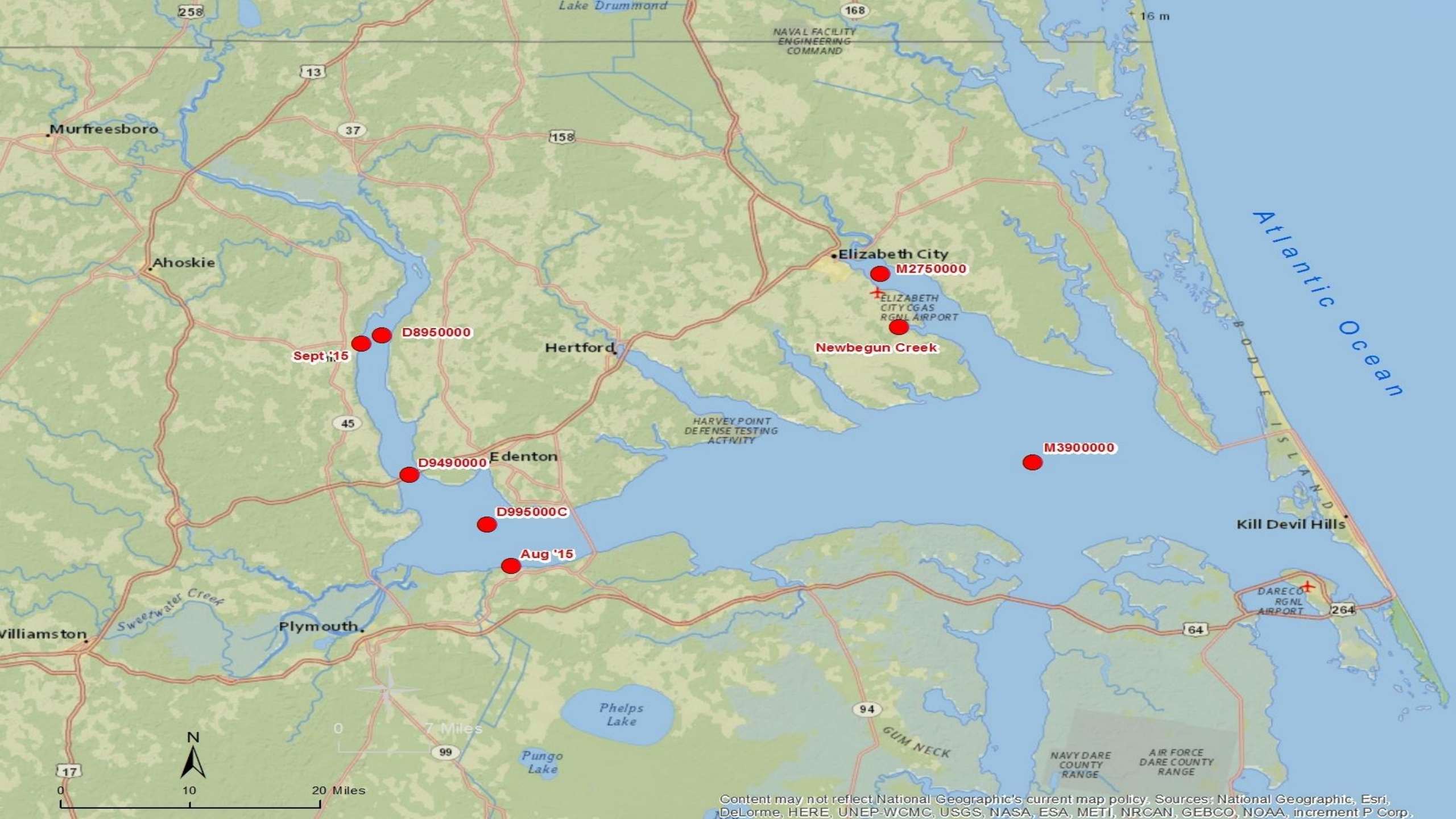
Algal Ecologist

Water Sciences Section

NC Division of Water Resources

elizabeth.fensin@ncdenr.gov

(919) 743-8421


Lake Drummond
NAVAL FACILITY ENGINEERING COMMAND
16 m
Murfreesboro
Ahoskie
Elizabeth City
M2750000
ELIZABETH CITY CGAS RGNL AIRPORT
Newbegun Creek
D8950000
Sept '15
Hertford
HARVEY POINT DEFENSE TESTING ACTIVITY
M3900000
Atlantic Ocean
BODIE ISLAND
D9490000
Edenton
D995000C
Aug '15
Kill Devil Hills
DARECO RGNL AIRPORT
Sweetwater Creek
Plymouth
Williamston
Phelps Lake
Pungo Lake
GUM NECK
NAVY DARE COUNTY RANGE
AIR FORCE DARE COUNTY RANGE
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# Albemarle Region Stations and Sampling Schedule: 2000-2015

- Albemarle Sound near Frog Island (M390000C)
- Albemarle Sound between Harvey Point and Mill Point (M610000C)

2000-2003: Samples collected 6 times/year

2006 to present: Very occasional blooms only. Usually 1 or 2 cyanobacteria blooms during summer.

2012-2013: USGS survey– samples collected throughout Sound. Most collected during summer. Not enough for seasonal patterns but did show Sound during summer is a lot fresher and full of more cyanobacteria than I expected.

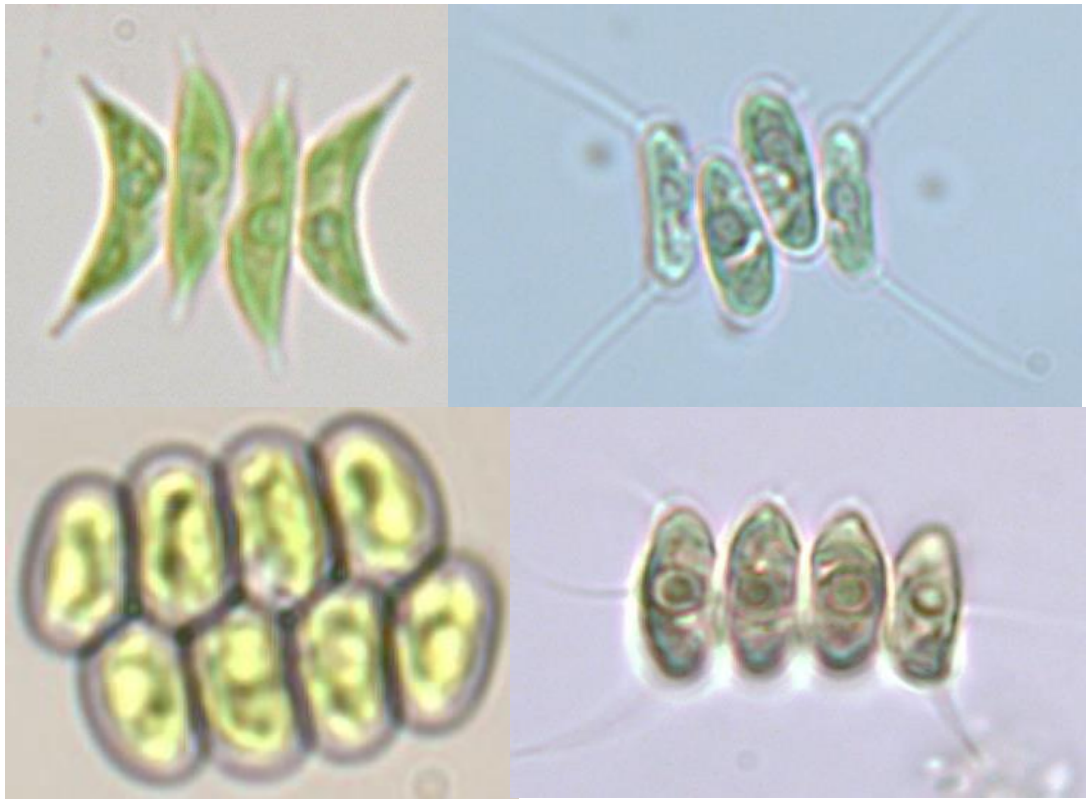
# Algal Samples Collected from Albemarle Region: 2000-2015

Almost all samples collected during summer.

- Albemarle Sound: 72
- Currituck Sound: 21
- North River: 13
- Pasquotank River: 7
- Five Samples or Less: Roanoke Sound, Yeopim, Alligator, Cashie, Perquimans, Motts Creek, Oregon Inlet, Scuppernong, Croatan

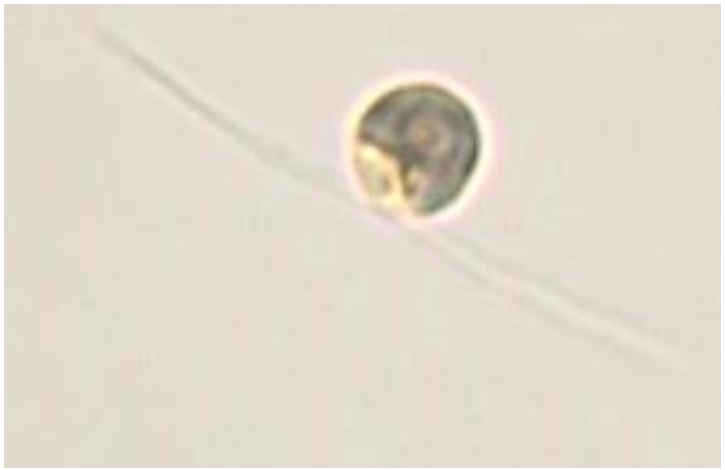
# Albemarle chlorophyte taxa (common but no blooms)

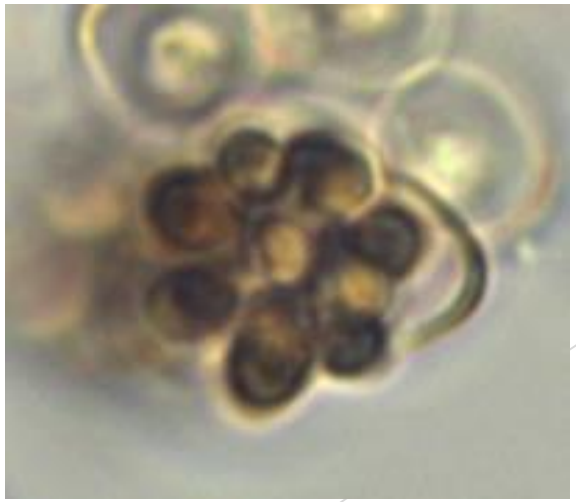
Green algae more common in freshwaters



*Scenedesmus*

*Chlamydomonas*





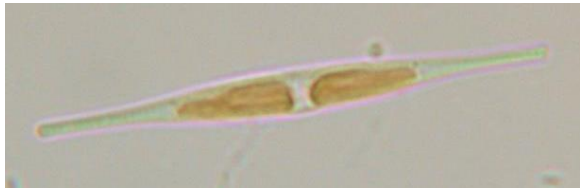
*Coelastrum*

# Albemarle diatom taxa (common and occasionally bloom)

Small, round diatoms ("*Cyclotella*")

very common in both fresh and saline waters

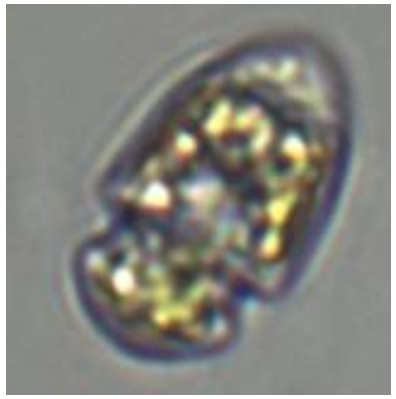
*Chaetoceros* (salty)



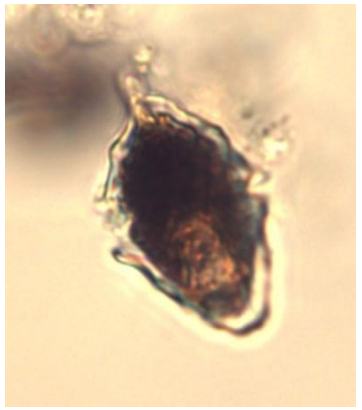
*Synedra* (fresh)

*Nitzschia* (salty)

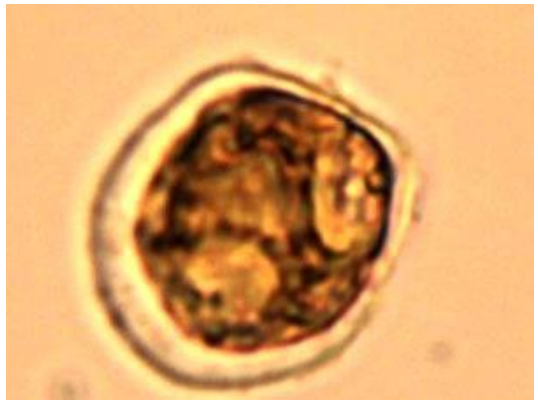
# Albemarle dinoflagellate taxa (often bloom in brackish water)



*Heterocapsa rotundata*



*H. triquetra*



*Prorocentrum*

winter/spring dinoflagellates

frequent estuarine blooms

*Gymnodinium*
(freshwater, rare)

*Karlodinium micrum*

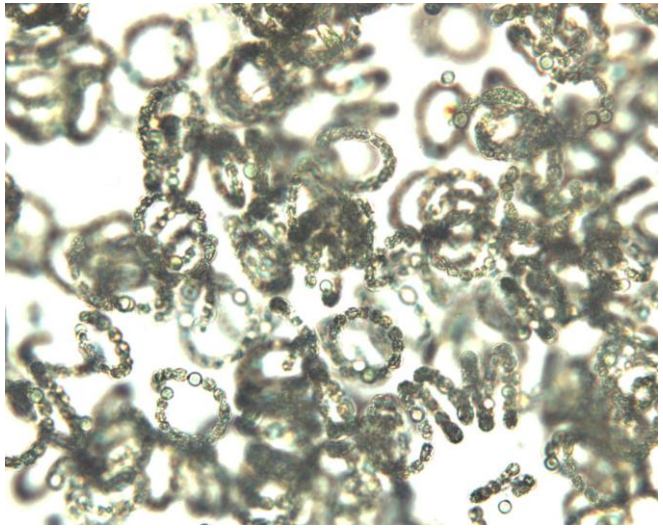
Frequent estuarine blooms

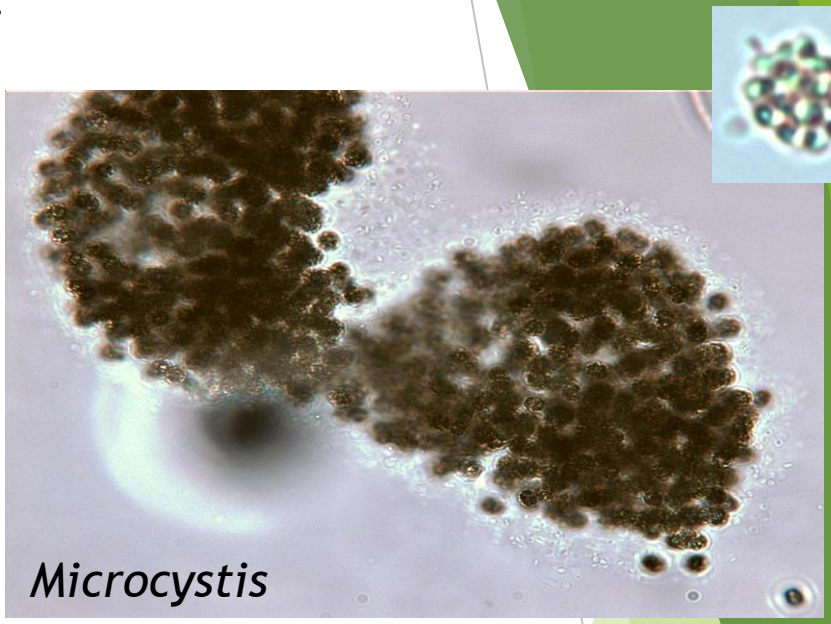
Reported to cause fish kills in Chesapeake

# Albemarle cyanobacteria taxa

Very common and bloom during summer.

FRESHWATER:



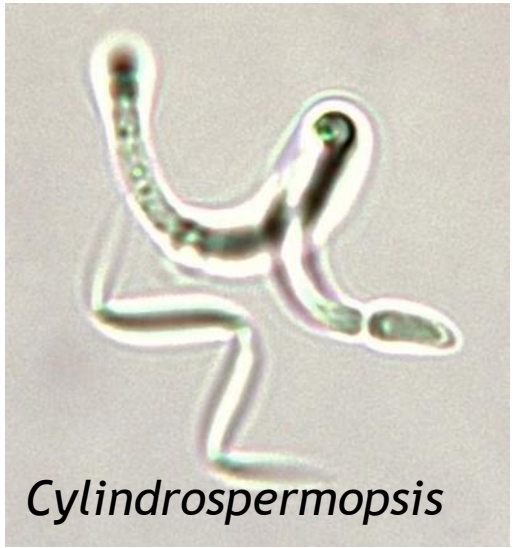


*Anabaena spiroides* (*Dolichospermum*) *Anabaena planctonica*

*Microcystis*

LOW-MID SALINITY:

*Aphanizomenon*



*Cylindrospermopsis*

*Pseudanabaena*

# Algal “bloom” is always a relative term

NC Division of Water Resources definitions of algal blooms:

- ≥ 10,000 units/ml (A “unit” is a single celled alga or a colony or filament of algal cells.)
- ≥ 5,000 $mm^3/m^3$ (biovolume or biomass)
- In the field, dissolved oxygen > 9 mg/L or >110% saturation or pH ≥ 8

It is not unusual for high dissolved oxygen samples to have low algal densities or high algal density samples to not have high D.O. or pH.

# Arbitrary DWR definitions of magnitude for algal blooms in lakes studied for Basin Assessment

When you want to say more than “the lake bloomed all summer”:

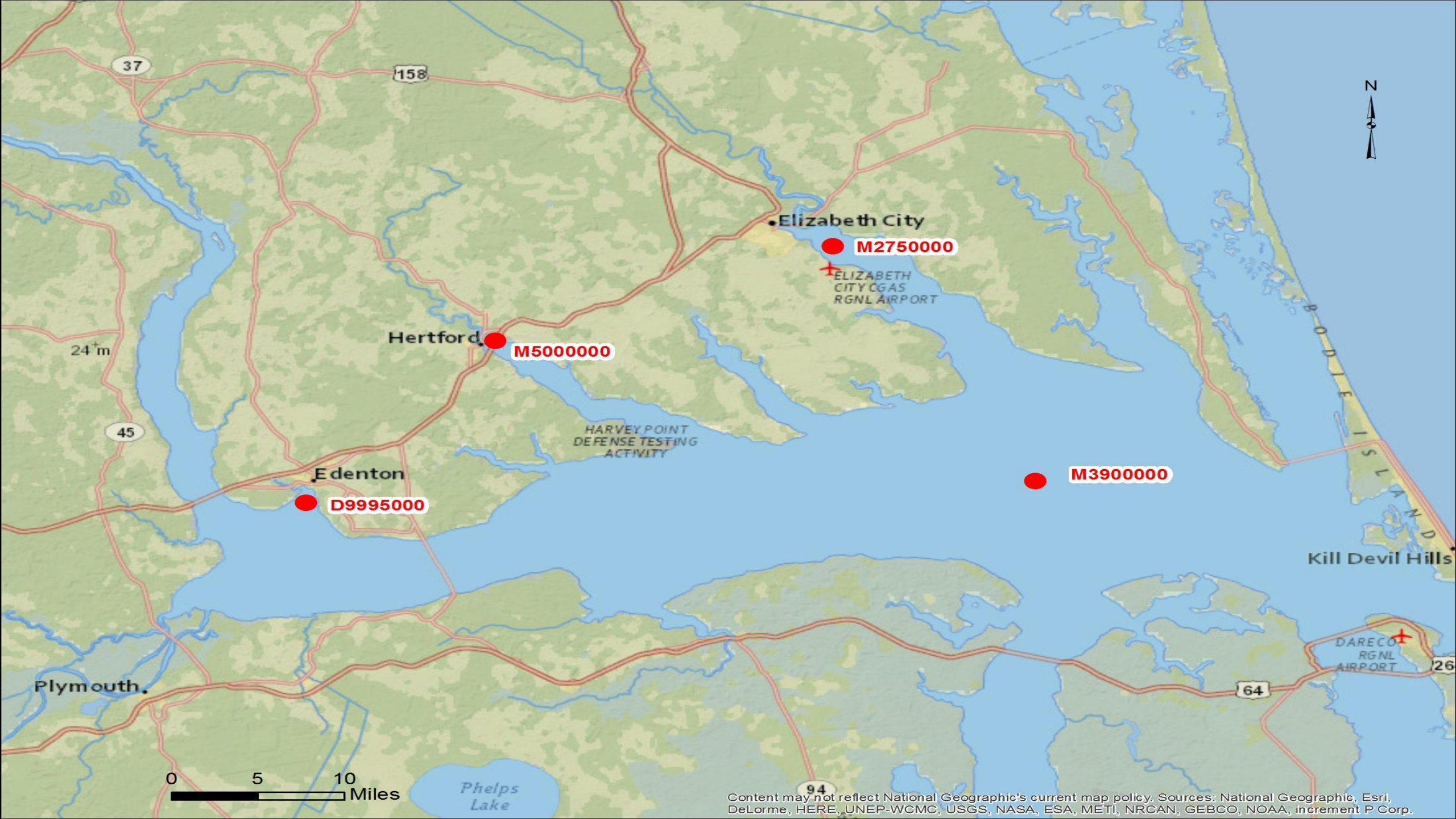
- “Mild” 10,000-20,000 units/ml
- “Moderate” 20,000-30,000 units/ml
- “Severe” 30,000-100,000 units/ml
- “Extreme” > 100,000 units/ml

These definitions were adopted by USGS for the Albemarle survey.

# Chlorophyll *a* and algal blooms

Chlorophyll *a* is an “after the fact” indicator of a bloom. By the time chlorophyll data are processed, phyto samples have usually been analyzed. Algal densities determine whether a bloom officially occurred.

It is a judgement call to say whether a bloom is caused by a single species or the sample’s total algal density or which taxa are responsible for high chlorophyll results.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M2750000
ELIZABETH CITY CGAS RGNL AIRPORT
Hertford
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Plymouth
Phelps Lake
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158
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64
94
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Miles
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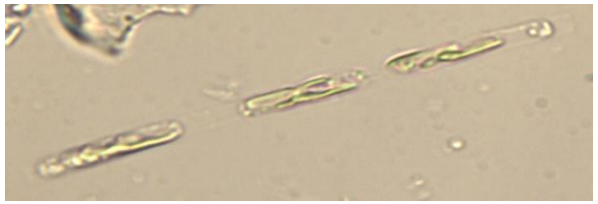
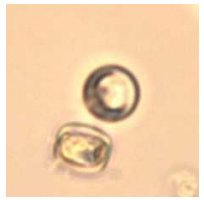
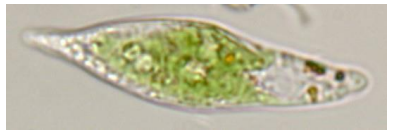
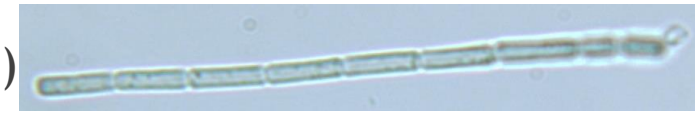
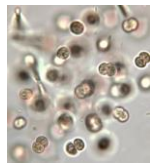
# Blooms at Albemarle Sound near Edenton (D9995000)

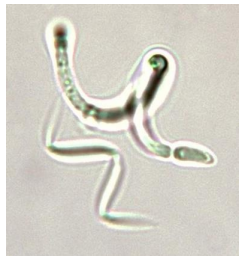
- May-June 2000: *Skeletonema* (diatom) 
- July 2006- round diatoms and *Heterosigma* (raphidophyte)

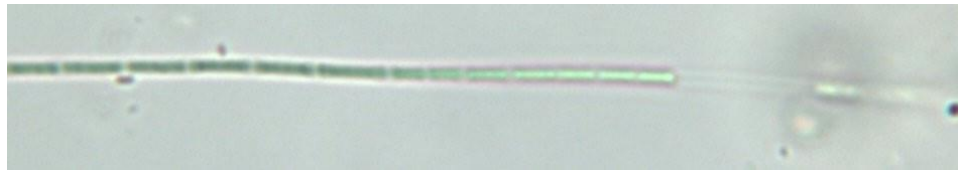


- September 2006- *Euglena* 
- July 2011 and 2012- *Pseudanabaena* (cyanobacteria) 
- August 2012- *Pseudanabaena*, *Aphanocapsa* (cyanobacteria) 
- July 2015- *Anabaena* (cyanobacteria) 

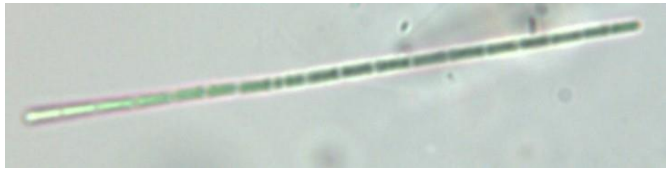
# Blooms at Pasquotank and Perquimans Rivers (M2750000, M5000000)

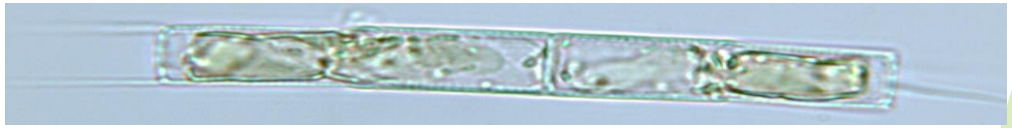
- June 2011- *Cylindrospermopsis*, *Planktolyngbya* (cyanobacteria)





- August 2012- *Pseudanabaena* (cyanobacteria), *Aulocoseira* (diatom)





- July 2011- *Heterosigma*, *Chattonella* on Perquimans (M5000000)

# Blooms at Albemarle Sound near Frog Island (M3900000)

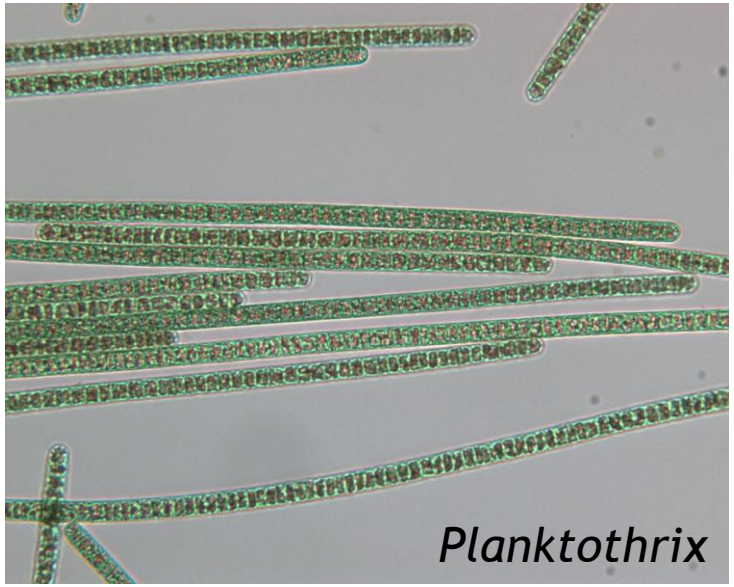
- March 2007- *Skeletonema* (diatom)
- September 2008- round diatoms

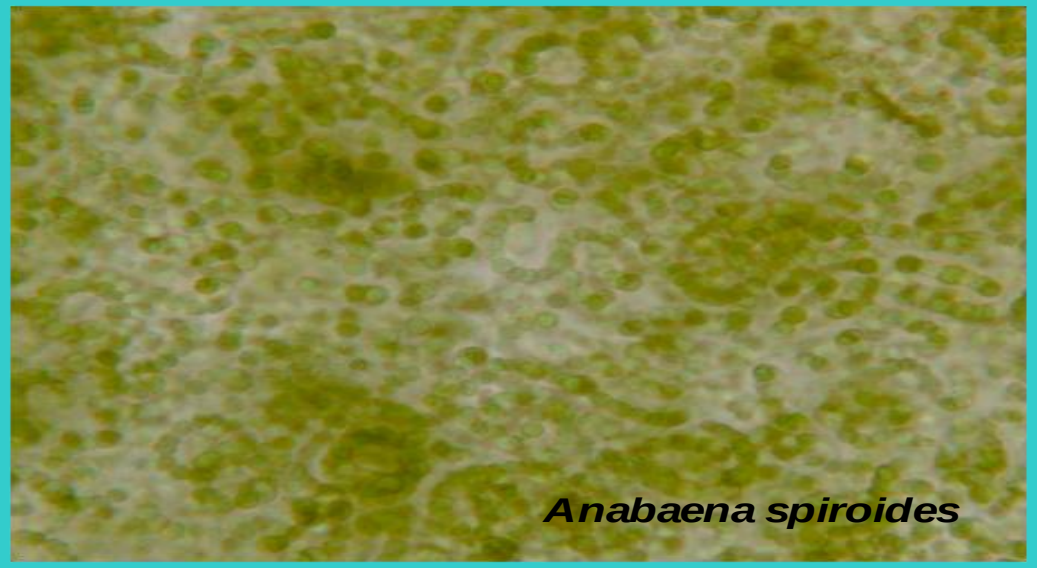

*Chroococcus*

- August 2005- *Cylindrospermopsis*, *Anabaena*, *Aphanizomenon*
- August 2009- *Cylindrospermopsis*, *Chroococcus*
- August 2010- *Cylindrospermopsis*
- Sept 2012- *Pseudanabaena*, *Cylindrospermopsis*
- July-September 2013- *Chroococcus*, *Pseudanabaena*, *Cylindrospermopsis*
- June 2015- *Chroococcus*, *Pseudanabaena*

# Random Filamentous Cyanobacteria Blooms

- August 2003- *Cylindrospermopsis* in Currituck Sound
- June 2007- exciting 3 hour *Anabaena* bloom on Newbegun Creek off Pasquotank
- July 2008- *Chroococcus*, *Cylindrospermopsis* (Perquimans County)
- August 2015- *Pseudanabaena*, *Anabaena*, *Chroococcus* in Albemarle (Chowan County)
- September 2015- *Chroococcus*, *Planktothrix* on Flatty Creek (Pasquotank County)






**Bluegreen Algae**
**(Pasquotank River, June 2007)**

# The Surprise Story of Summer 2015: ongoing cyanobacteria blooms!