

# The 2011 Tidal Potomac *Microcystis* bloom

## Overview and Historical Context

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and MW COG for their funding assistance

# Microcystis Bloom 1985

- Mason began sampling the tidal Potomac in 1984 and captured data from the 1985 bloom
- The bloom was centered in the same portion of the lower tidal freshwater river from Gunston Cove to Mattowoman
- Note chlorophylls in excess of 100  $\mu\text{g/L}$  over a large portion of that area

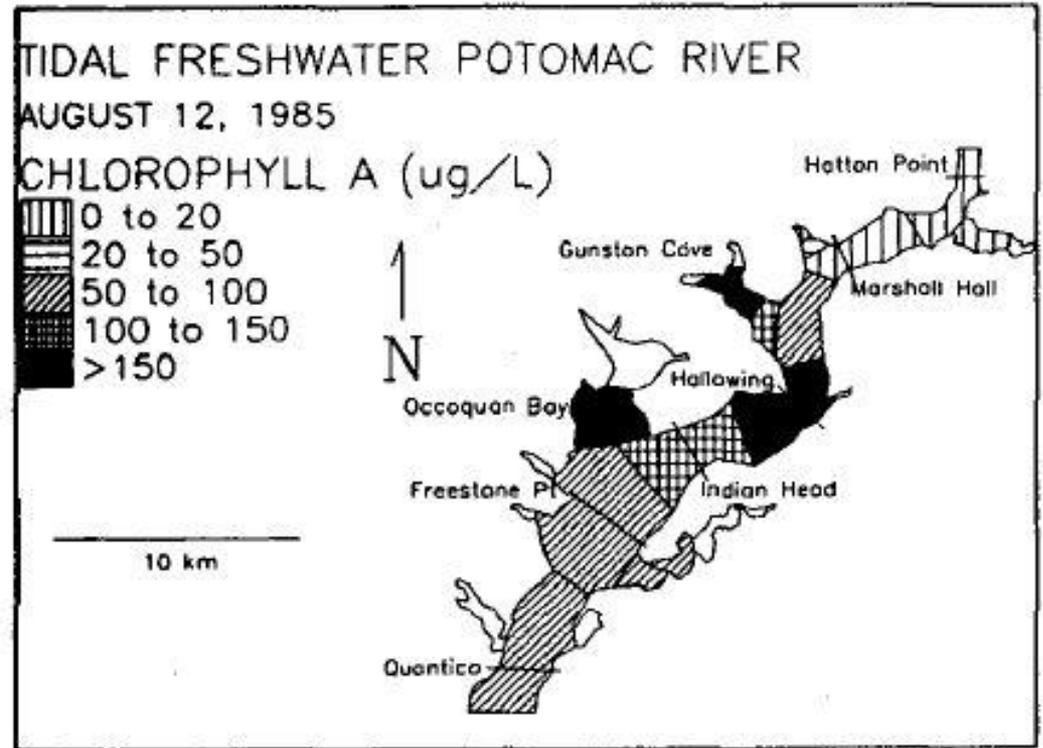


Fig.2. Lower portion of the tidal freshwater Potomac River showing chlorophyll distribution on August 12. Transects are shown as lines perpendicular to the river. Values depicted are averages for each region.

# Microcystis Bloom 1985

- These blooms were associated with large diurnal swings in pH and DO
- The very high pH (well above 10) values turned out to be problematic when it was discovered that these were promoting excessive P release from the sediments

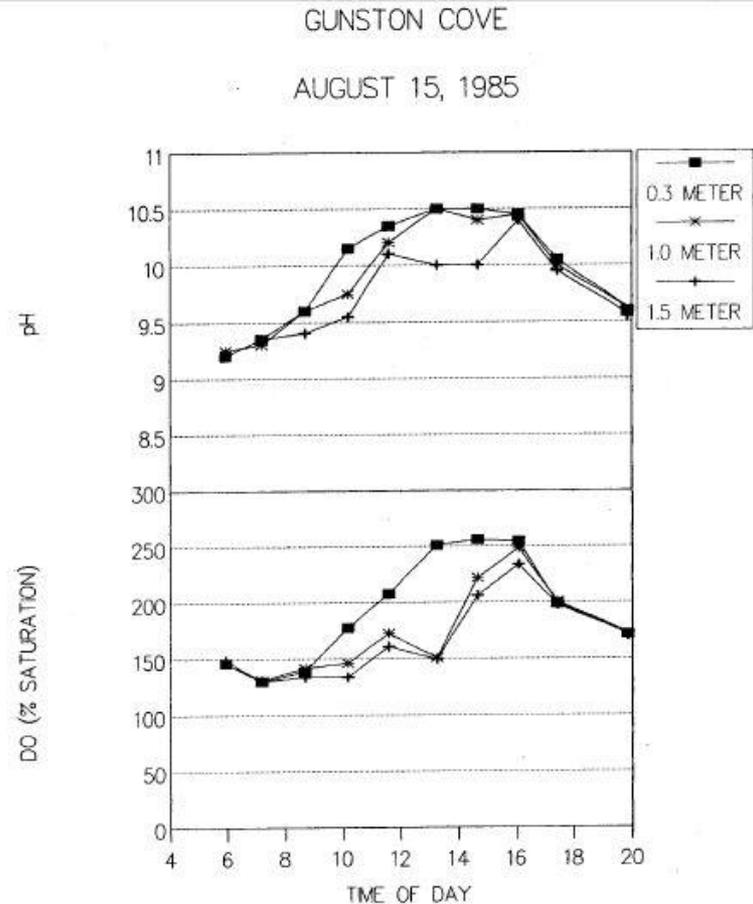
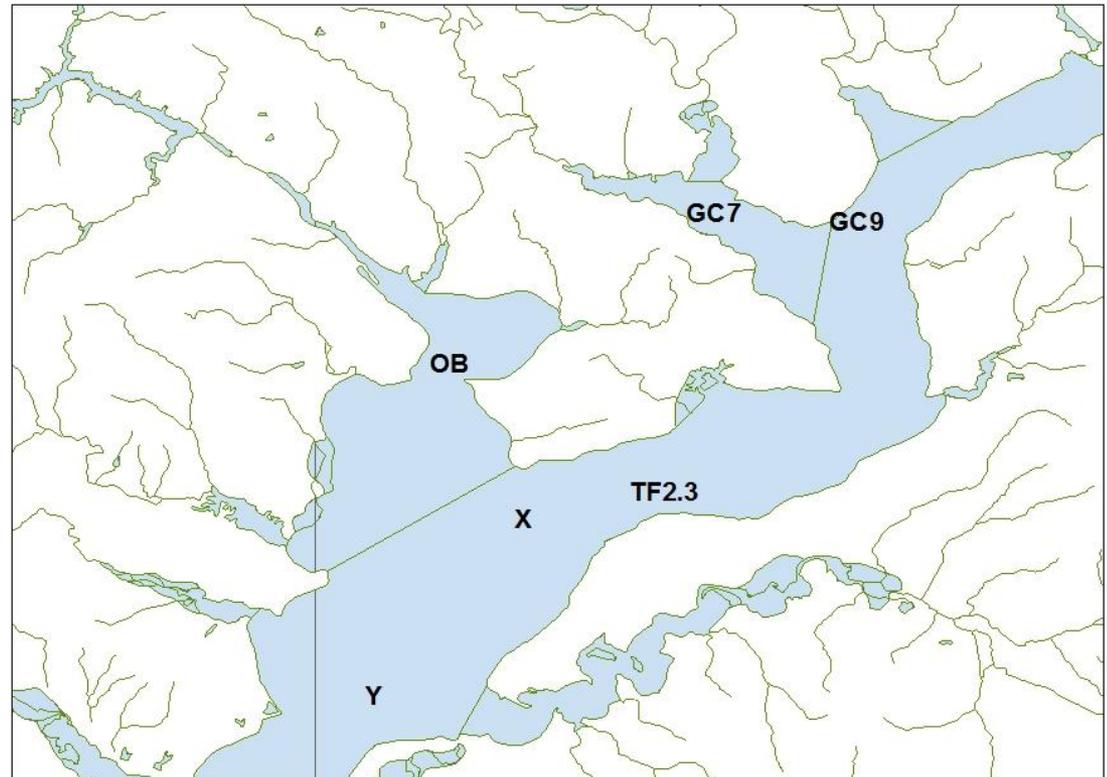


Fig. 3. Diurnal variations in pH and dissolved oxygen at the Gunston Cove station on August 15 at each of three depths.

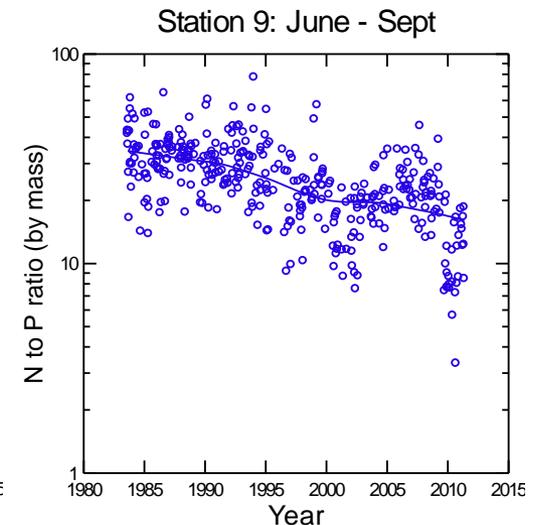
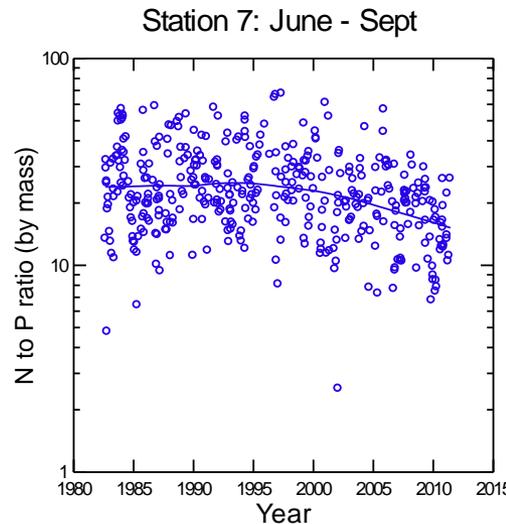
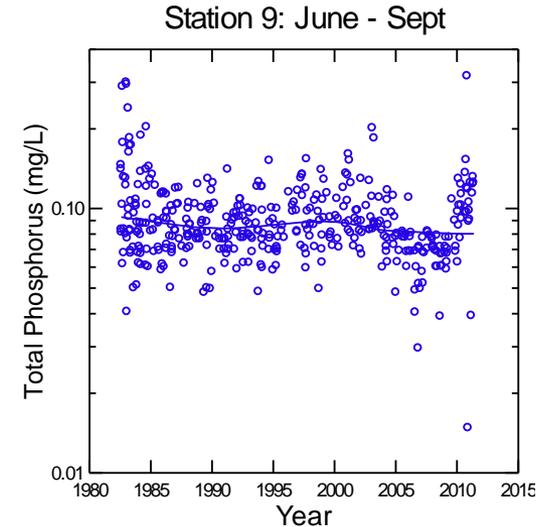
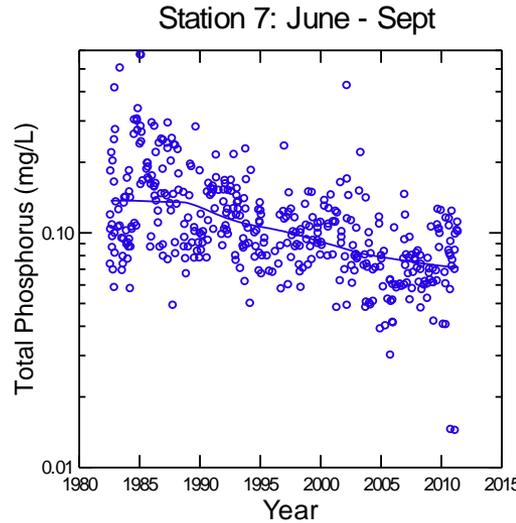
# Sampling Stations - 2011

- The 2011 *Microcystis* bloom was first detected in mid July
- PEREC used the existing semimonthly Fairfax Co monitoring program at GC7 and GC9
- And additional sites at TF2.3, OB, X and Y to track the progress of the bloom



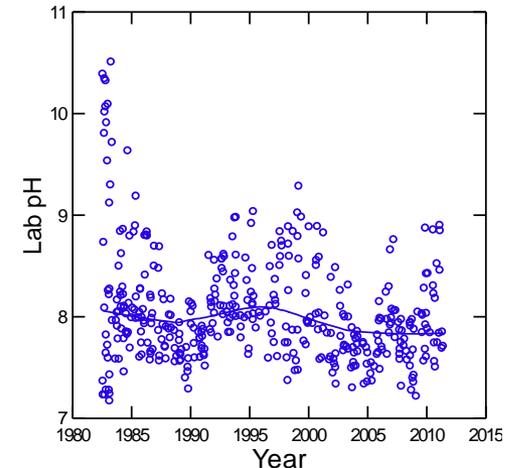
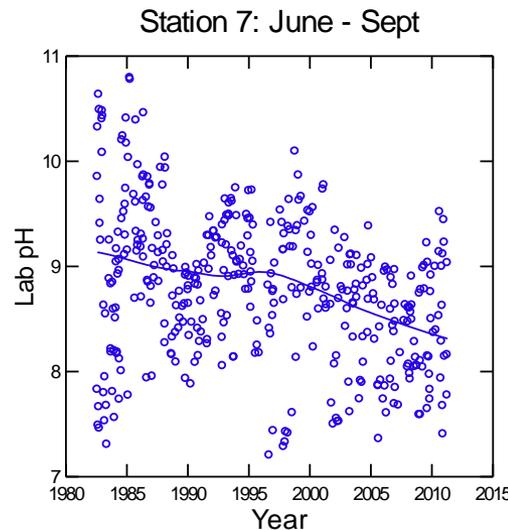
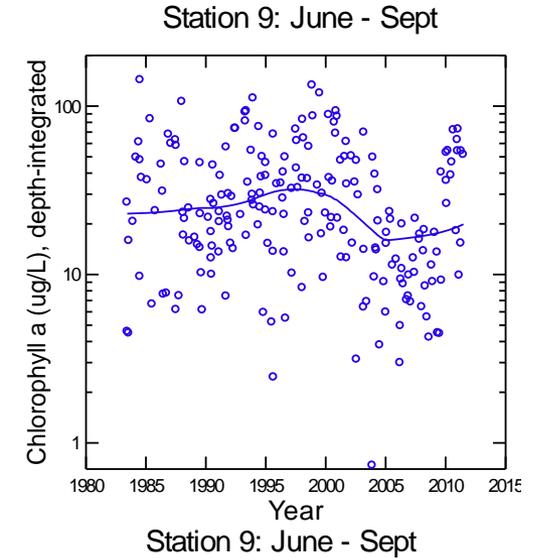
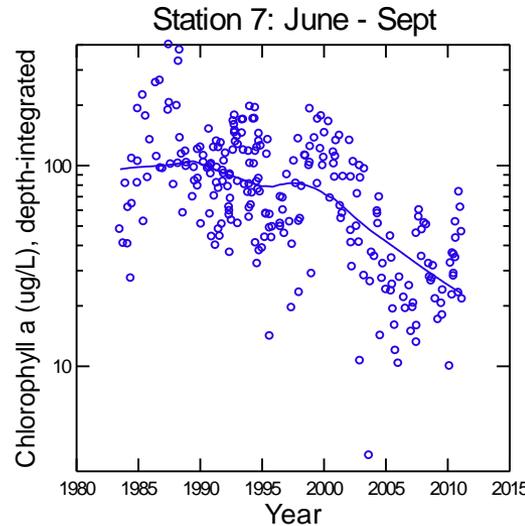
# Long Term Trends

- Total P in Gunston Cove (top left) shows definite decline over time since elevated values of the 1980's.
- Total P in River Mainstem (top right) does not show a consistent trend over the yrs
- N/P in cove (bot left) was constant until about 2000 and has gradually declined since.
- N/P in river (bot rt) has been declining steadily as N has been removed upstream
- Redfield ratio by mass is 7.2 so almost all values indicate P limitation



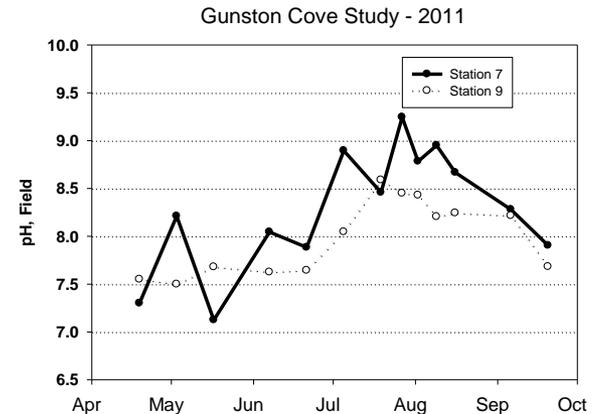
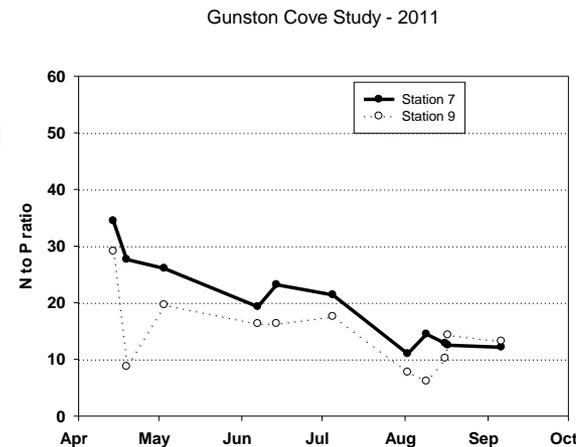
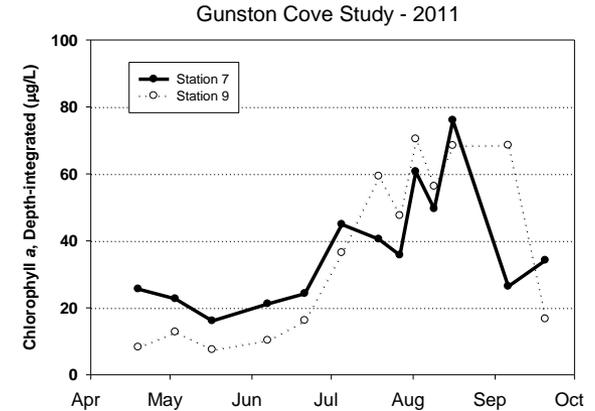
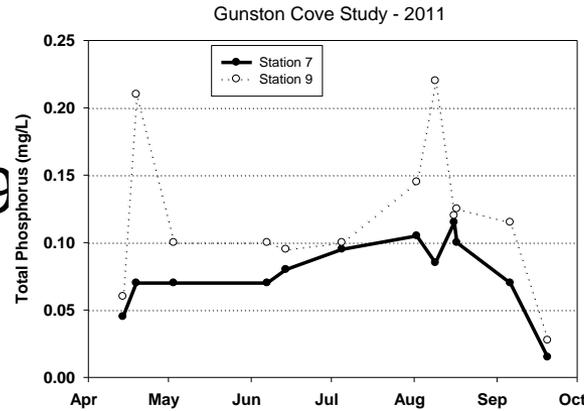
# Long Term Trends

- Chl a values often exceeded 100 ug/L during mid to late 1980's in the cove (top left), but beginning about 2000 a strong decline set in and now values are rarely above 60 ug/L (a bit higher in 2011)
- In the river (top, rgt), chl a rarely exceeded 100 ug/L in routine monitoring, but also declined about 2000. But in last few years higher values have crept back in (2011, for example)
- pH which was thought to be a driver in 1980's blooms was definitely higher in both cove and river during that period
- And episodically since, but remembering last diagram, P and chlorophyll no longer reach the excessive levels indicating sediment release has declined.



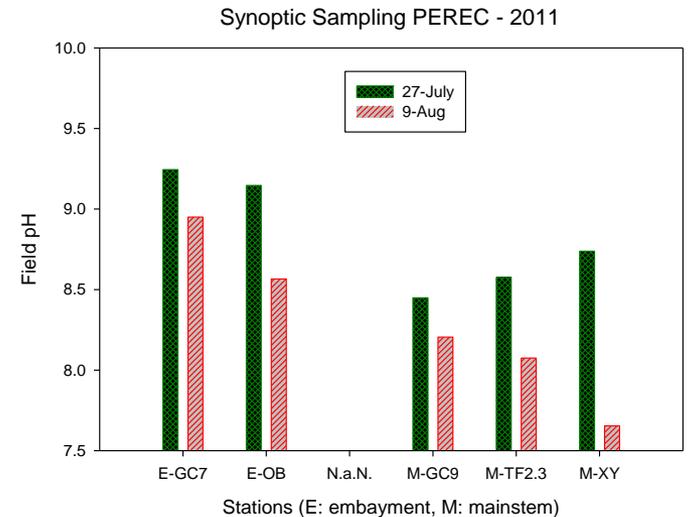
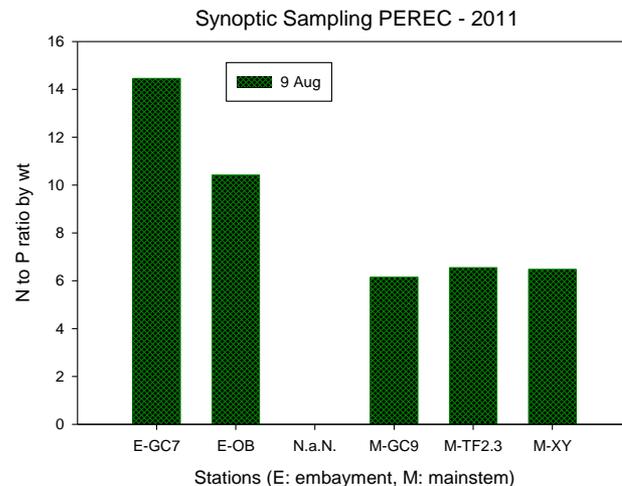
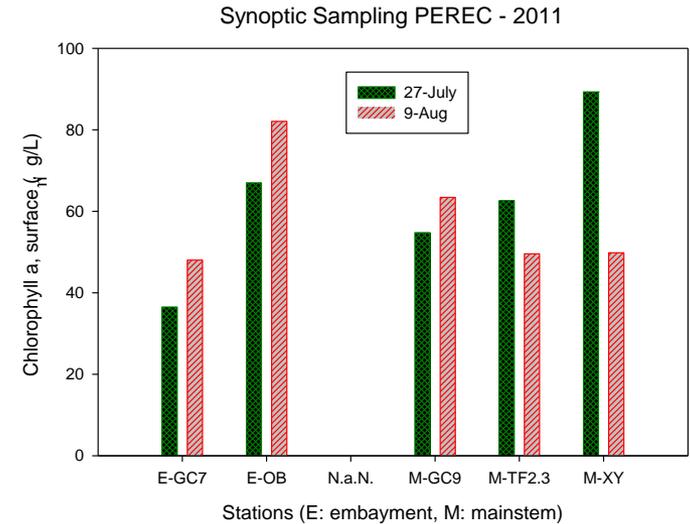
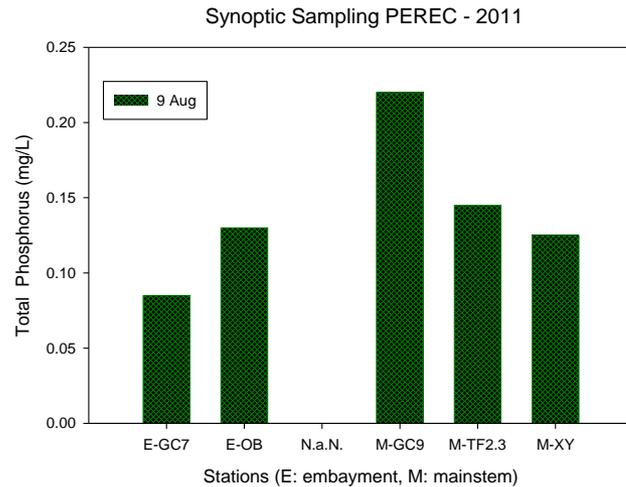
# Summer 2011 – GC 7 and GC 9

- Total P was actually higher at GC9 (mainstem) than at GC7
- Chl was about the same at both stations
- pH and N to P ratio were slightly higher at GC7



# Summer 2011 – Synoptic Surveys

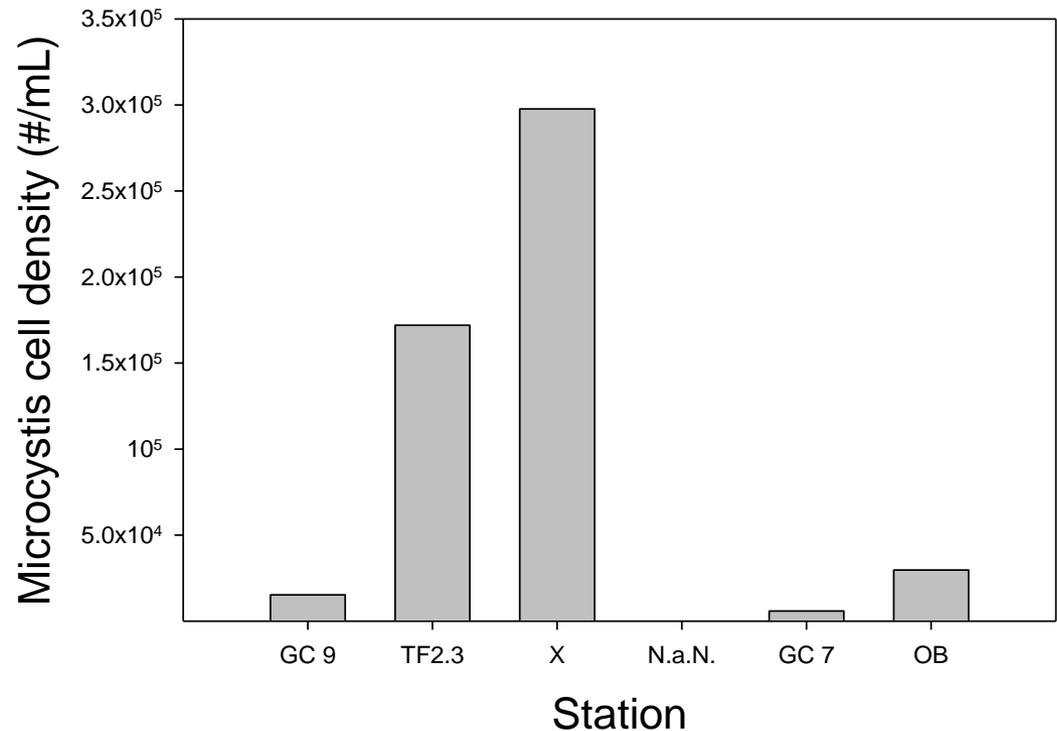
- On two dates more stations were included
- There was not a lot of difference among stations in most parameters
- Nutrients were not available on July 27



# Synoptic Surveys- 2011

- Highest Density of *Microcystis* was found at two of the mainstem stations in synoptic surveys
- This was different than the 1983 bloom when densities were higher in the embayments

PEREC Microcystis Bloom Sampling  
July 27, 2011

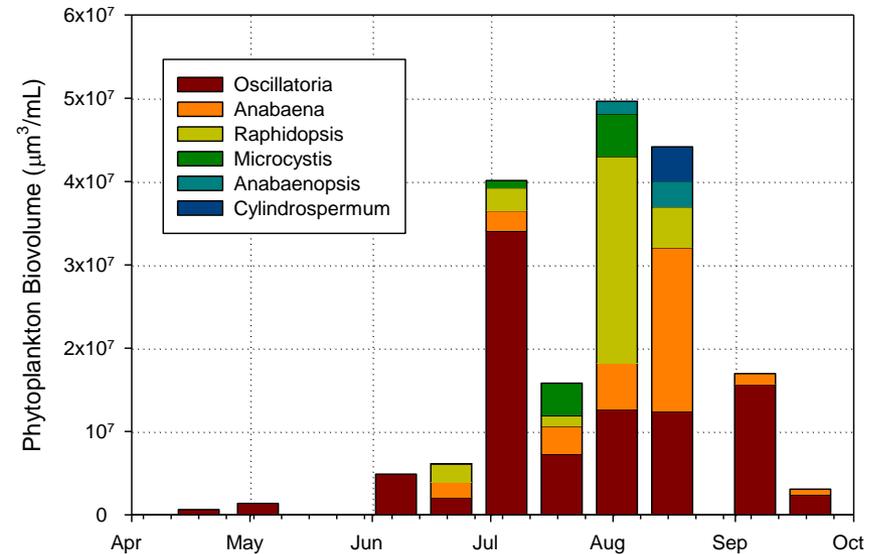


Data based on live colony counts courtesy  
Walt Butler, MD DNR

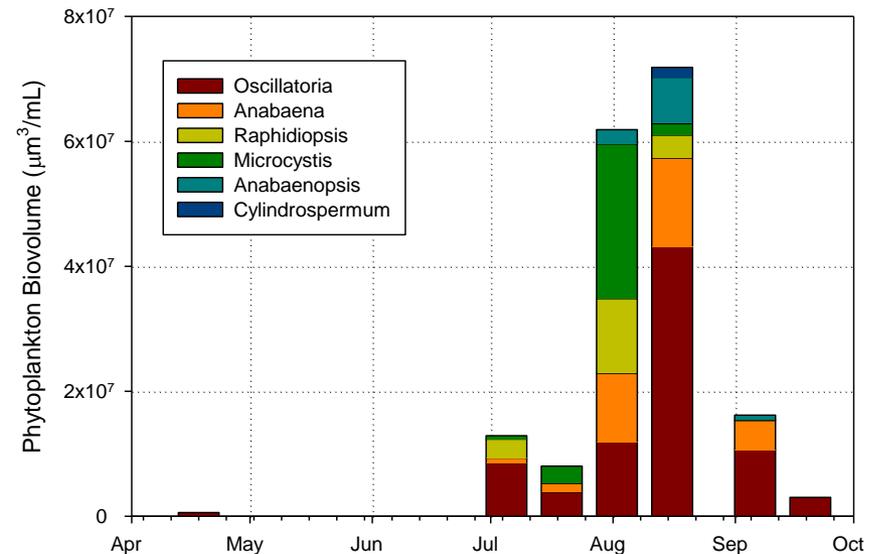
# Summer 2011 – GC 7 and GC 9

- In Fairfax Co monitoring, *Microcystis* was quite important in August, but was not even the dominant cyanobacterium in most cases
- Note that it was more abundant in the river (GC9) than in the cove (GC7)

Gunston Cove Study - 2011  
Cove Station 7



Gunston Cove Study - 2011  
River Station 9



# 2011 Bloom Photographs



Station GC9: lower density



Station X: very high density

# 2011 Bloom



Plankton net tow of bloom



Plankton net samples from various stations



Photomicrograph of Microcystis 2011