

2011 *Microcystis* Bloom in the Potomac

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MWCOB presentation
August 9, 2012

Overview

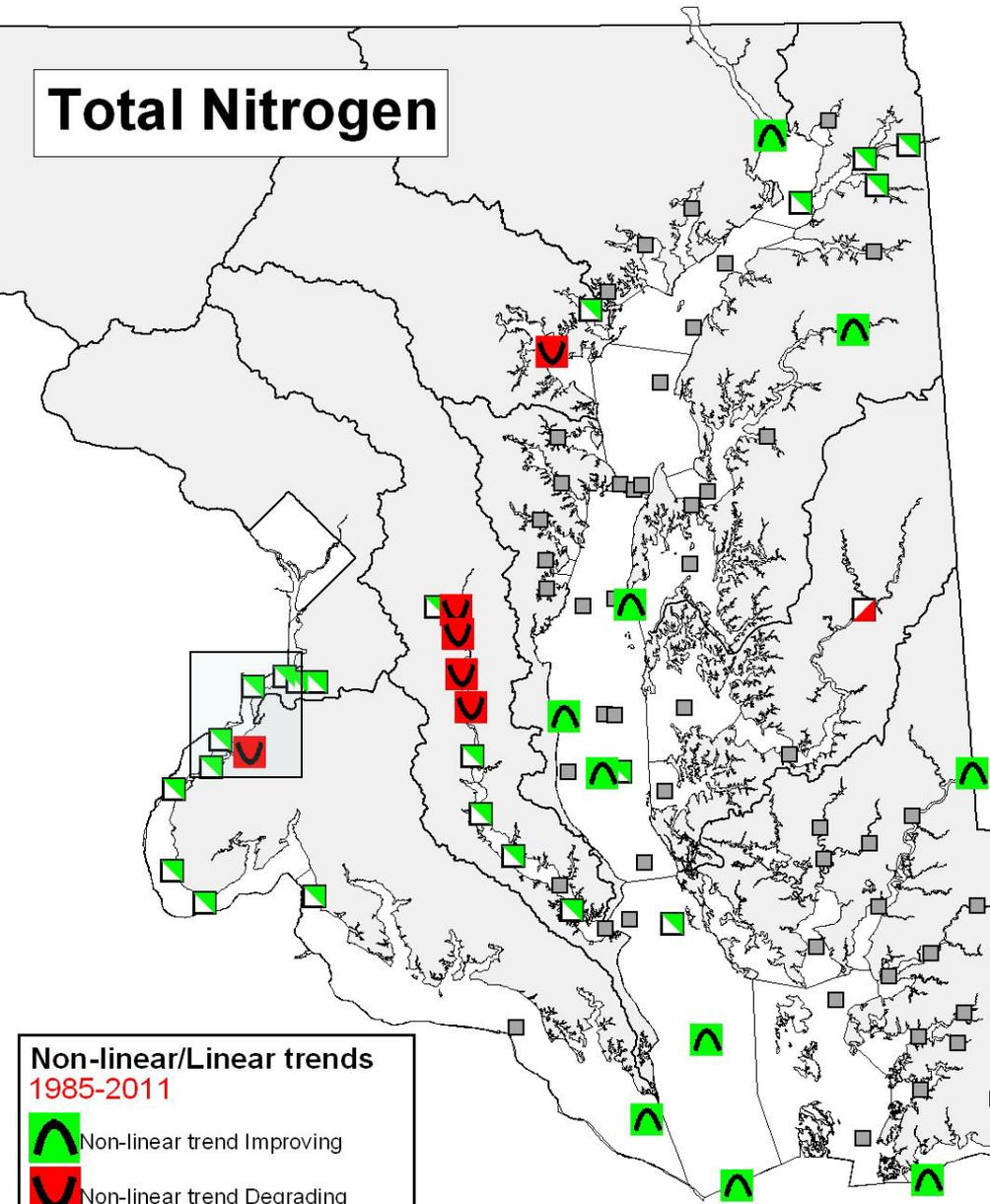
- Trends in the Potomac and Baywide
- 2011 compared to historic
- 2011 in review



Potomac Bloom, 8/1/11- VA DEQ

Water Quality Trends

Total Nitrogen



Non-linear/Linear trends 1985-2011

- Non-linear trend Improving
- Non-linear trend Degrading
- Non-linear trend not significant
- Linear trend Improving
- Non-linear trend not significant
- Linear trend degrading
- No significant trend

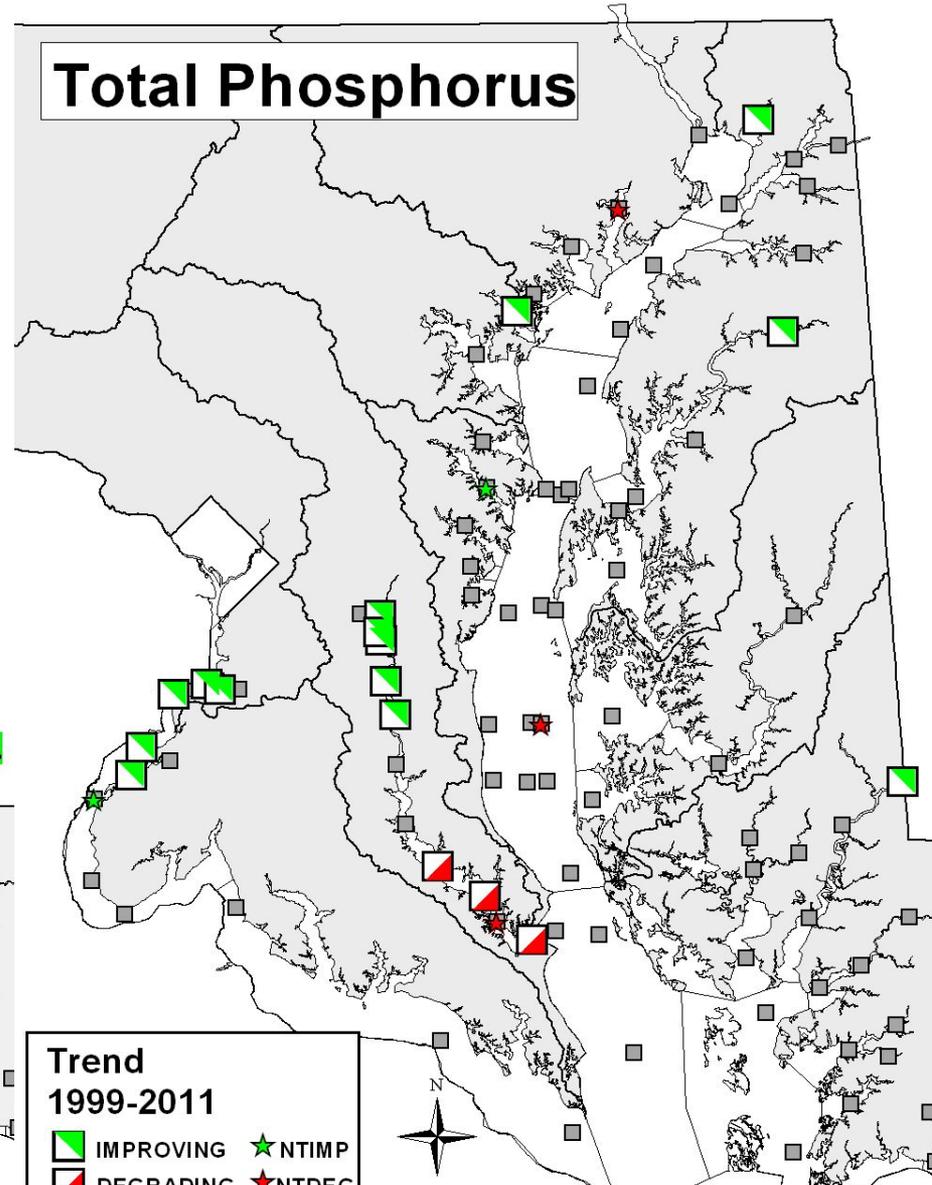
10 0 10 Miles

Scale is 1:900,000

All trends are observed data
Trends are significant at $p \leq 0.01$.



Total Phosphorus



Trend 1999-2011

- IMPROVING
- DEGRADING
- No trend
- NTIMP
- NTDEG

10 0 10 Miles

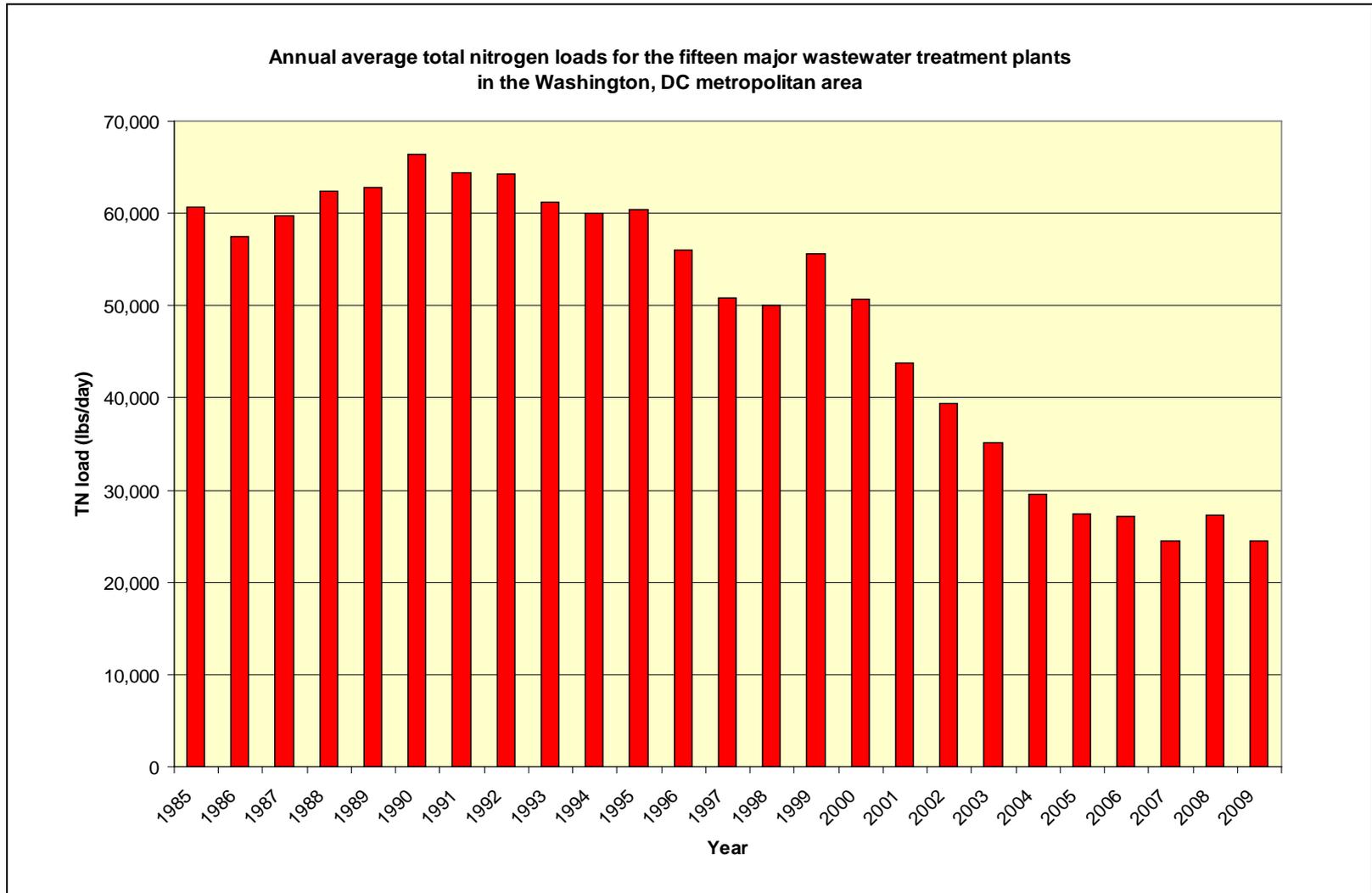
Scale is 1:900,000

All trends are observed data (not flow adjusted).

Trends are significant at $p \leq 0.01$. Stars indicate trends that are $0.01 < p < 0.05$.

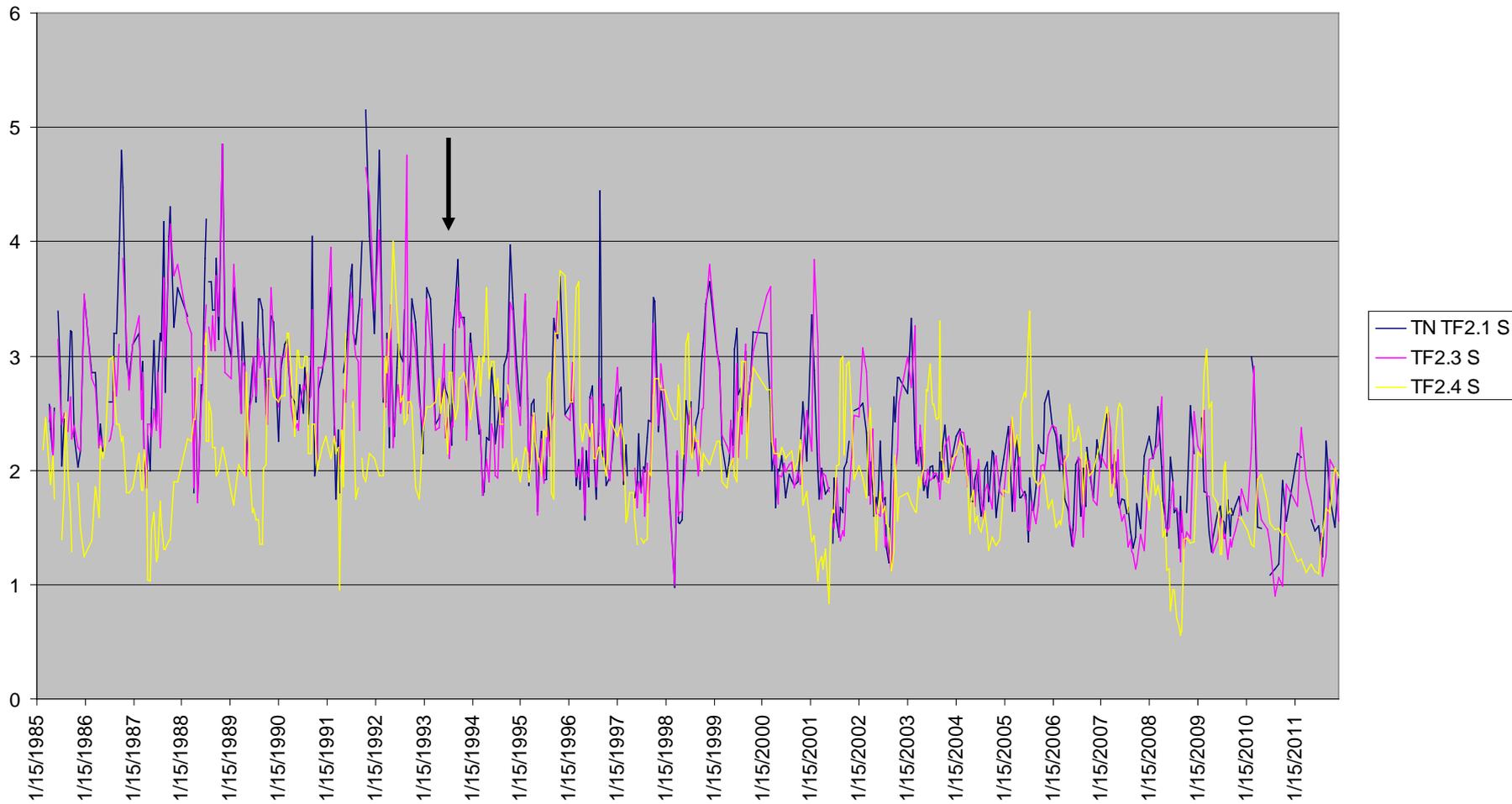


WWTP discharge decreases



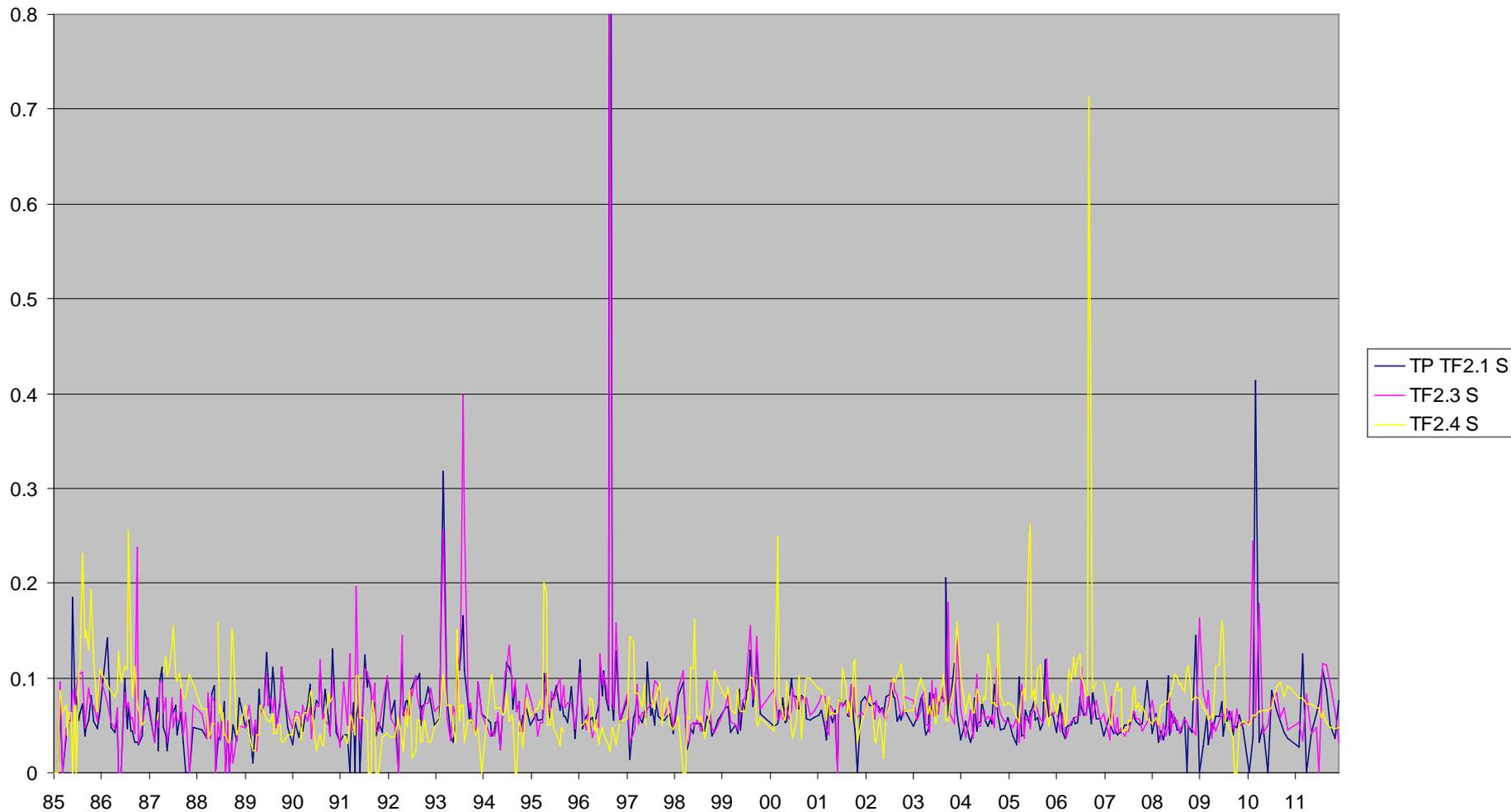
Total Nitrogen major declines

TN middle Potomac

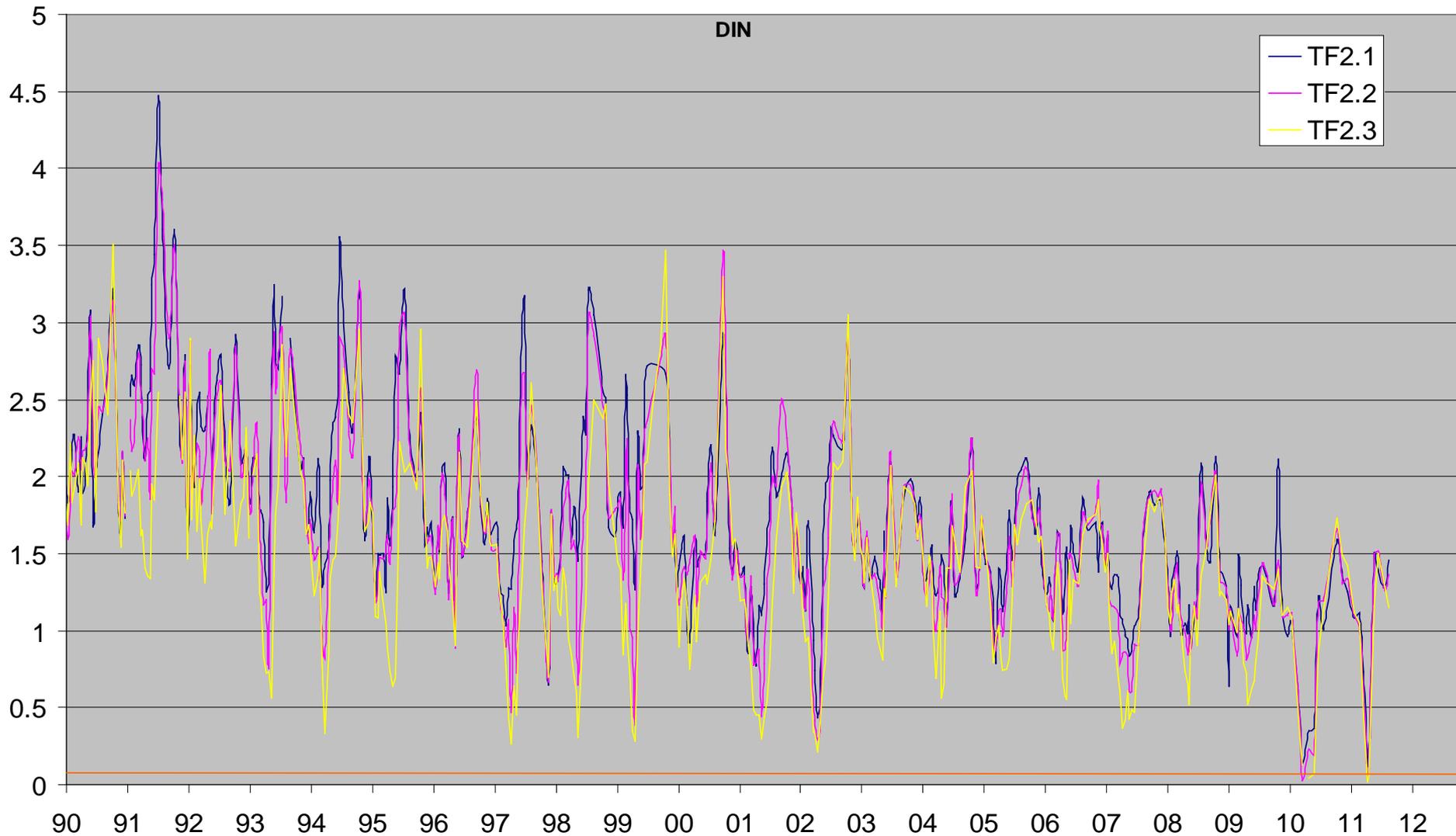


Total Phosphorus some improvement

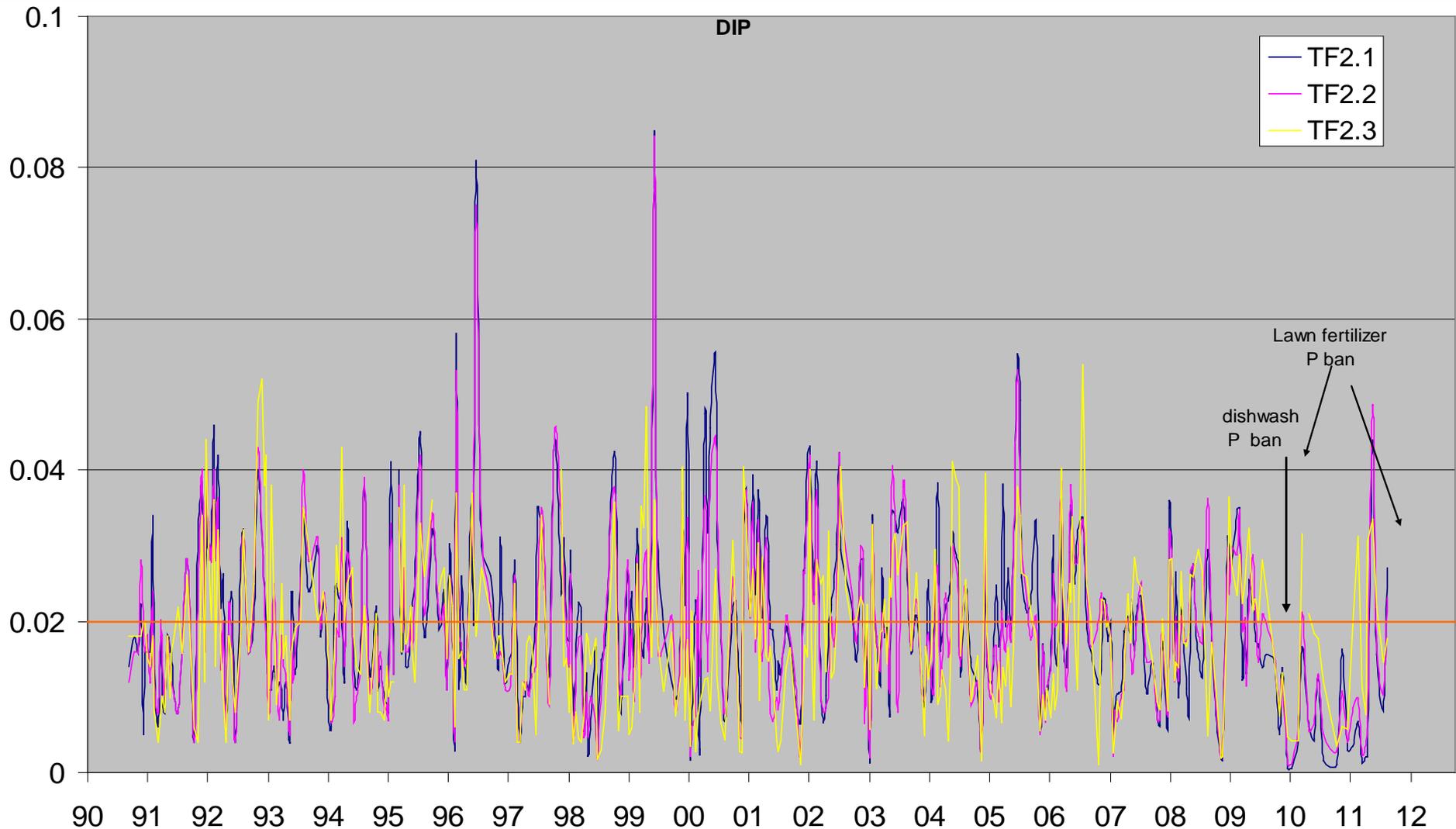
TP middle Potomac



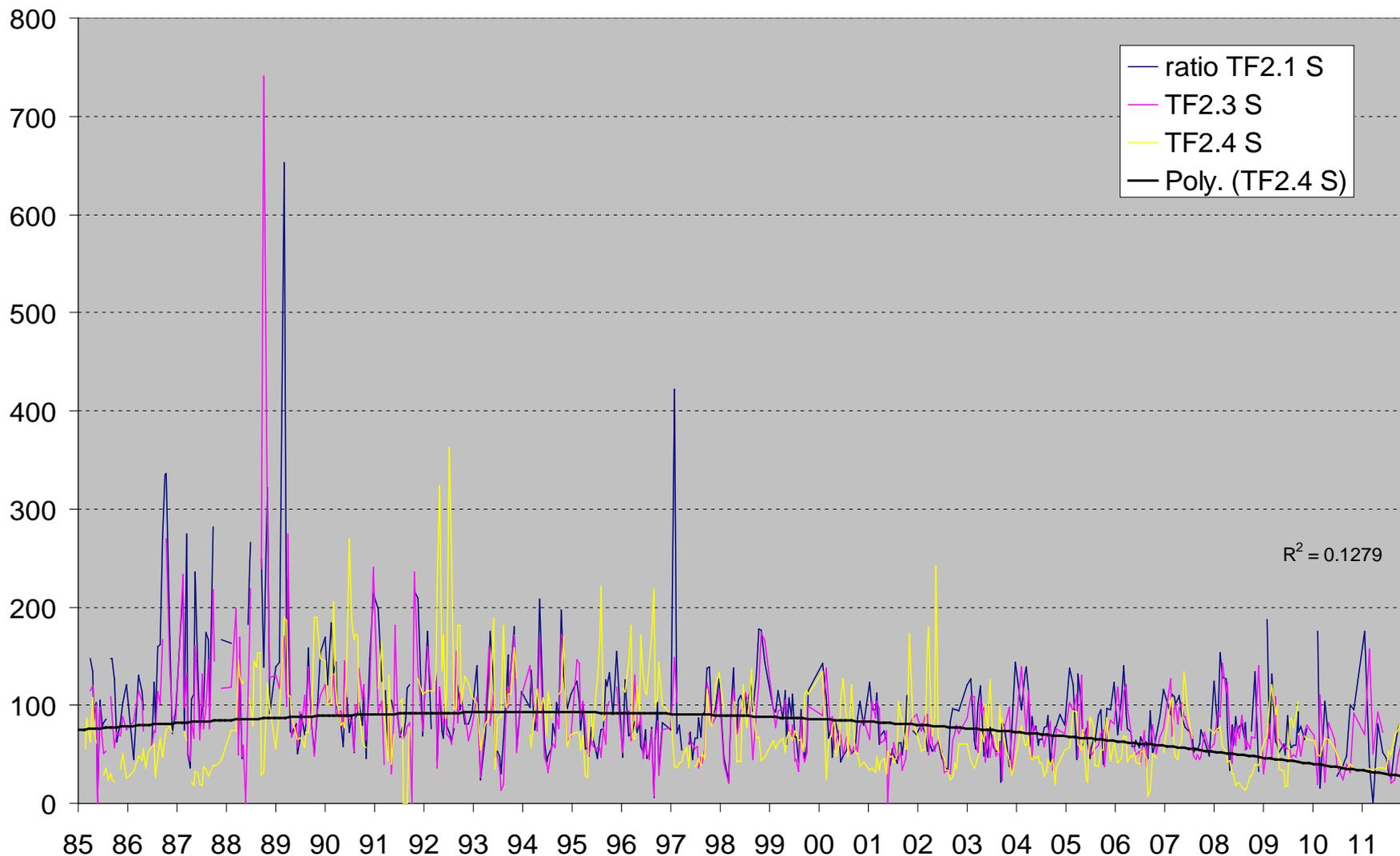
DIN declines, still above N-lim threshold



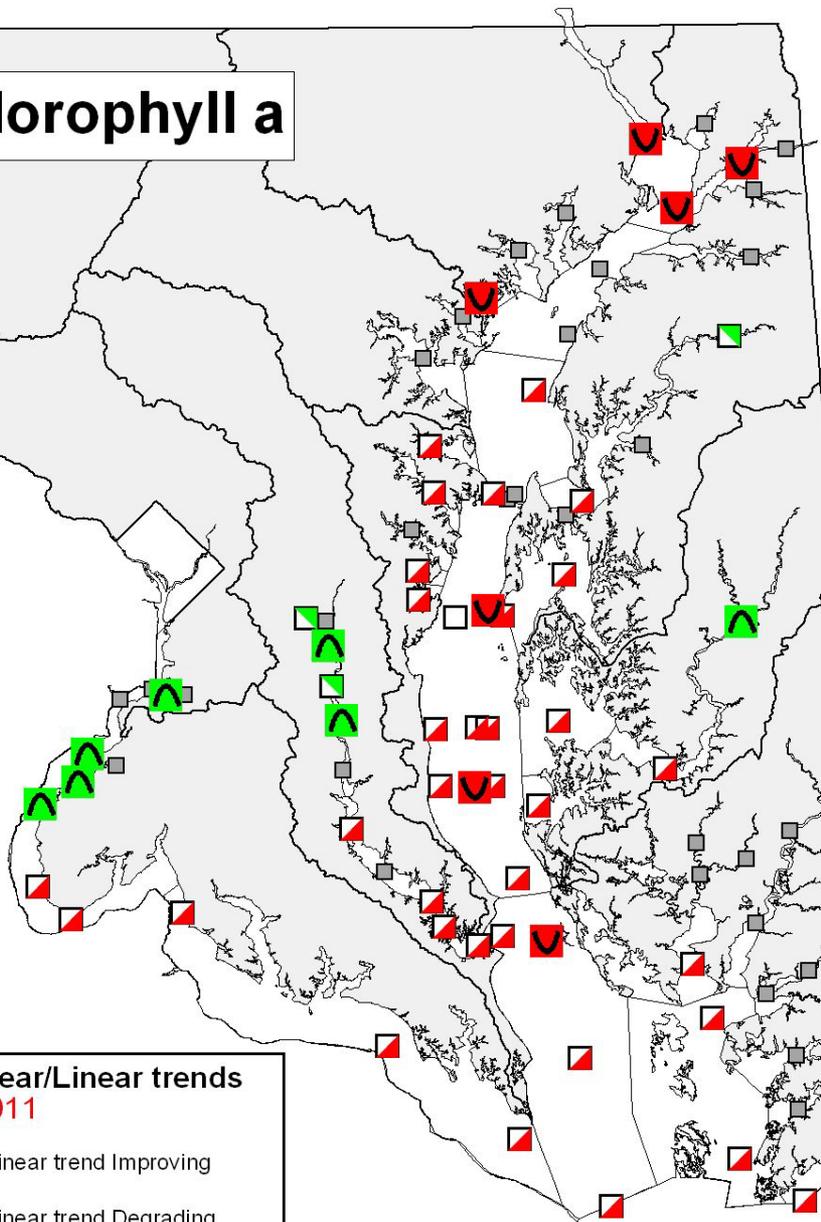
Phosphate declines below SAV threshold



TN:TP ratios show declines



Chlorophyll a



Non-linear/Linear trends 1985-2011

-  Non-linear trend Improving
-  Non-linear trend Degrading
-  Non-linear trend not significant
-  Linear trend Improving
-  Linear trend Degrading
-  No significant trend

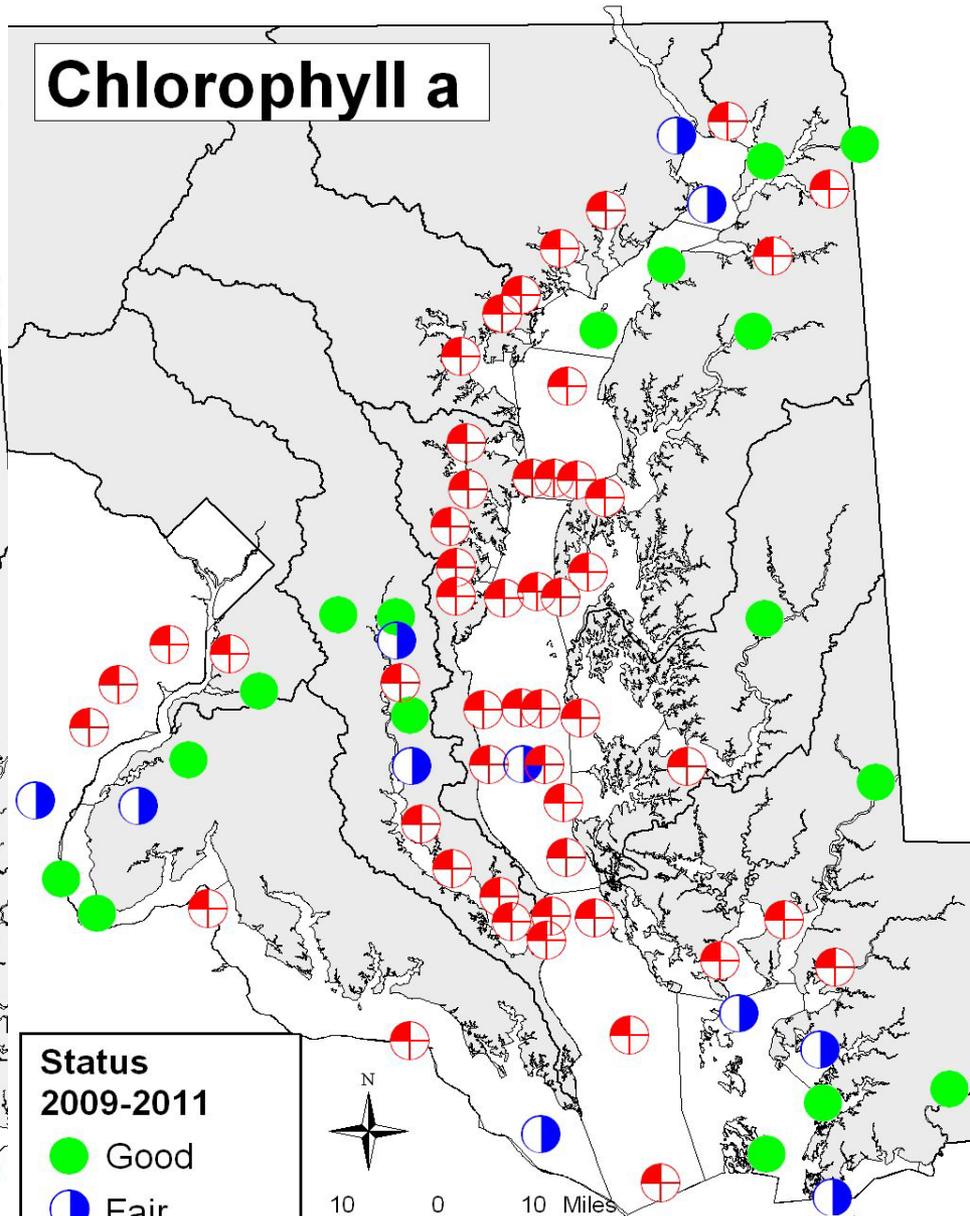
10 0 10 Miles

Scale is 1:900,000

All trends are observed data
Trends are significant at $p \leq 0.01$.



Chlorophyll a



Status 2009-2011

-  Good
-  Fair
-  Poor



10 0 10 Miles

Scale is 1:900,000

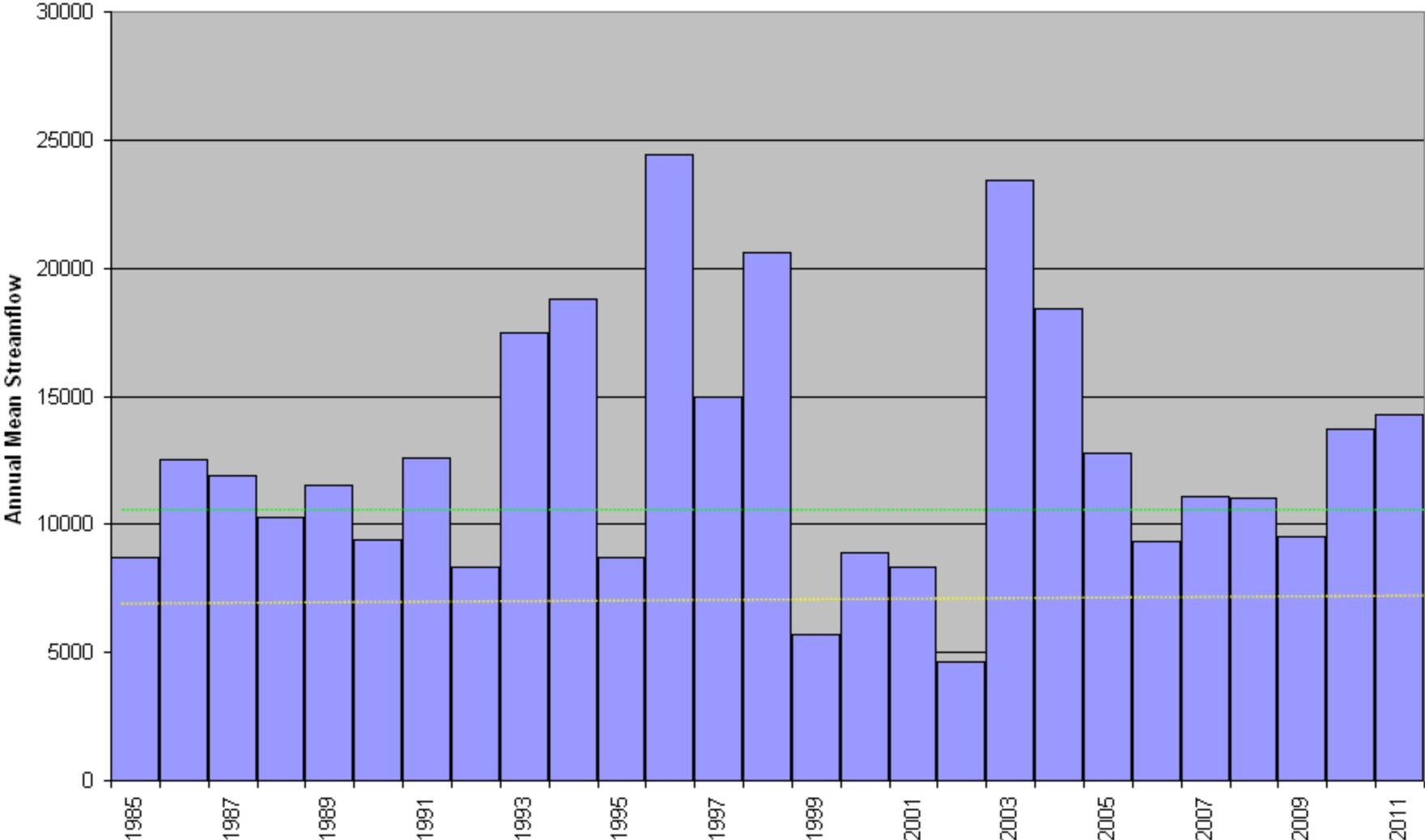


2011 vs. Historic

Flow
Loads
Water quality
Nutrient Ratios
Microcystis

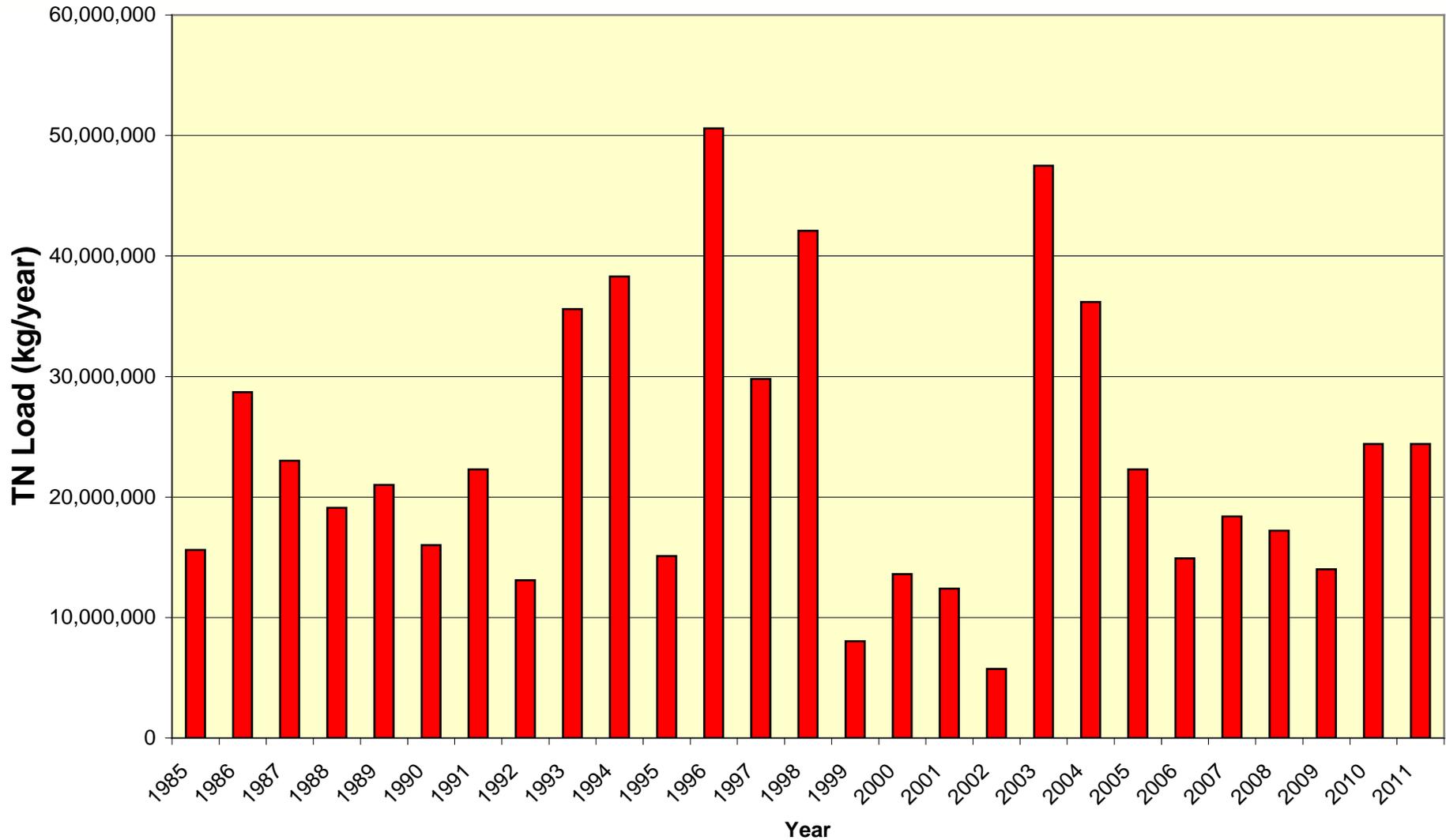


Potomac Streamflow -Point of Rocks

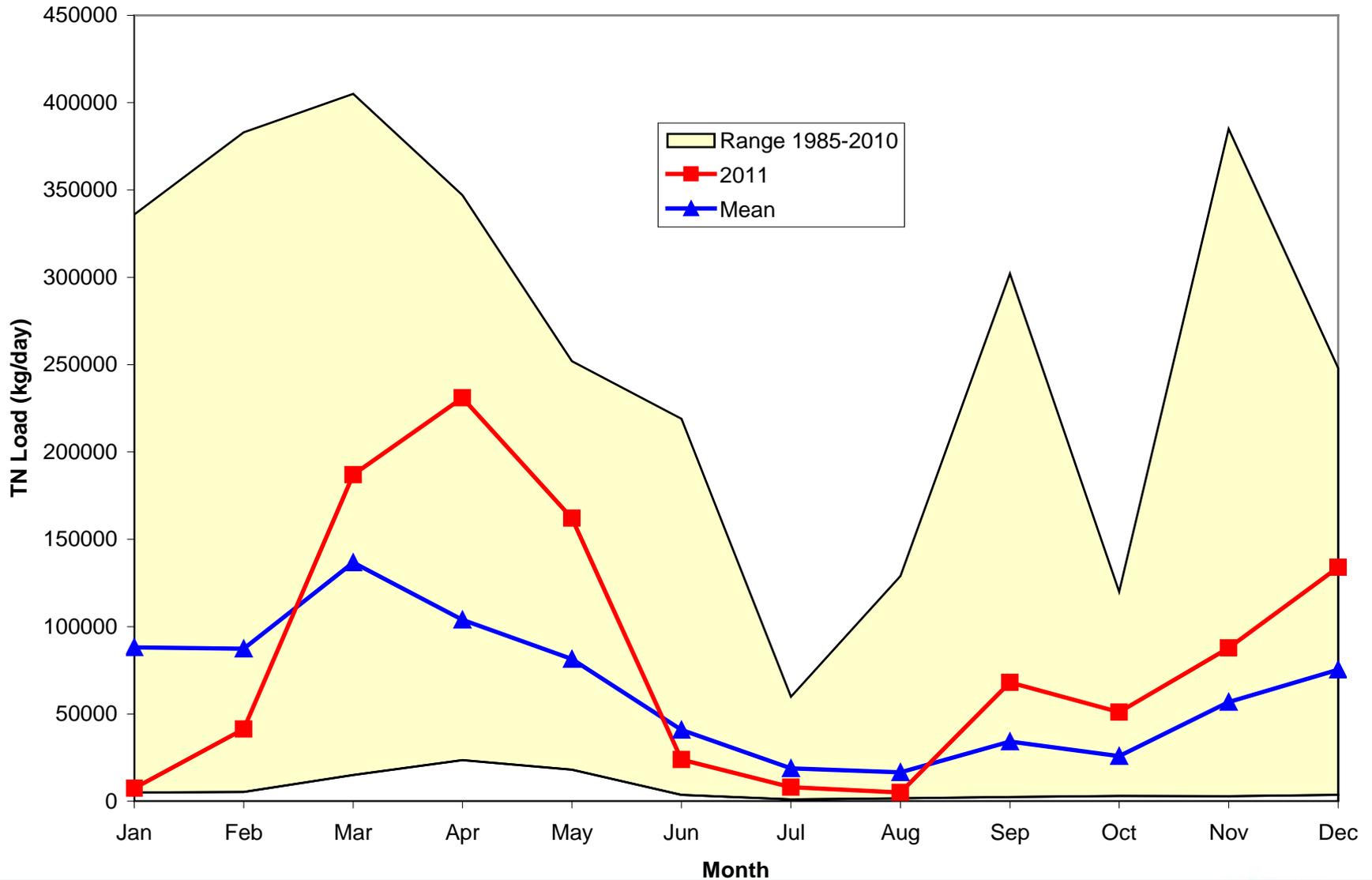


TN loads at Chain Bridge moderate in 2010 and 2011

Annual total nitrogen loads at Chain Bridge
(1985-2011)

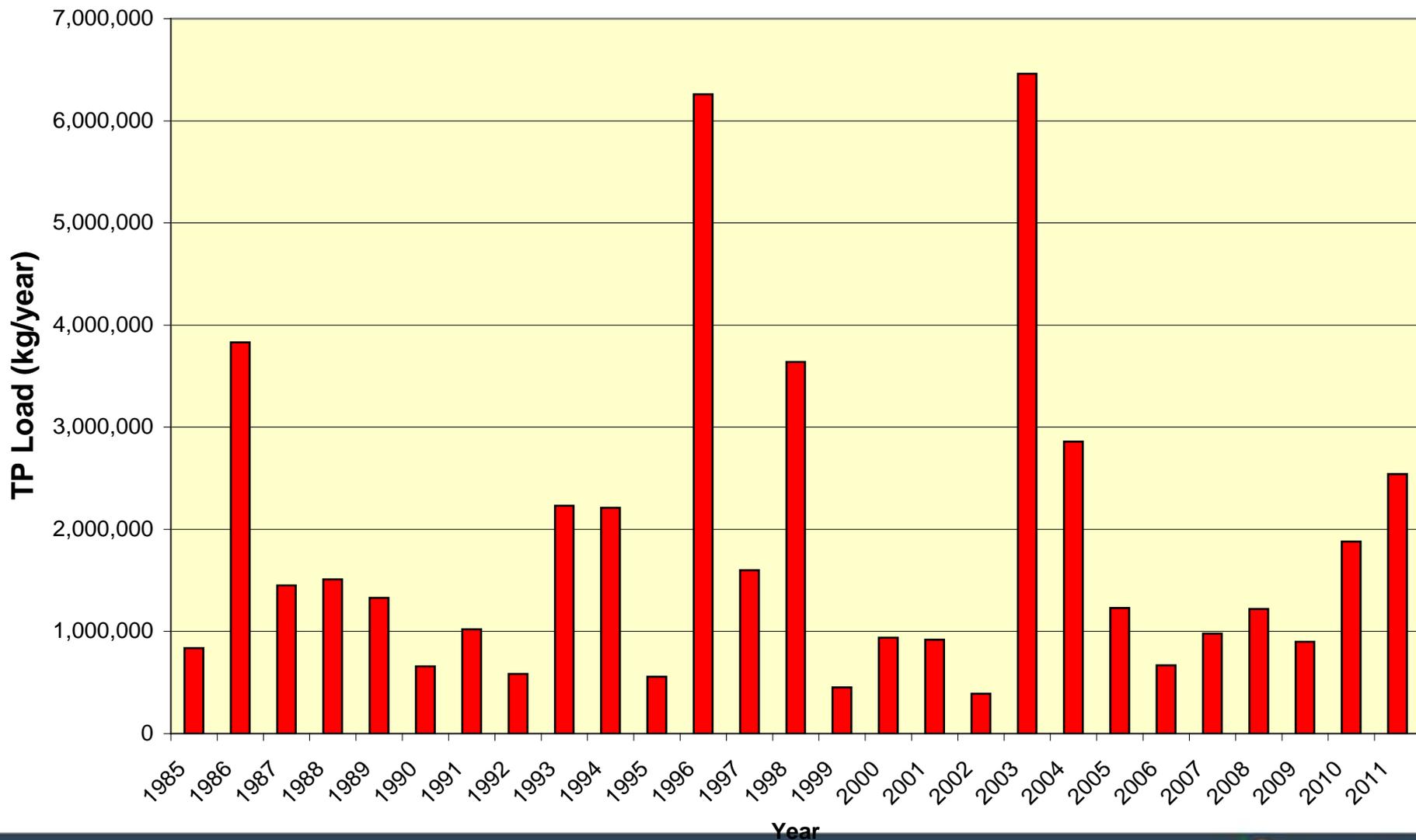


Total nitrogen loads at Chain Bridge for 2011 compared to range and mean for 1985-2010

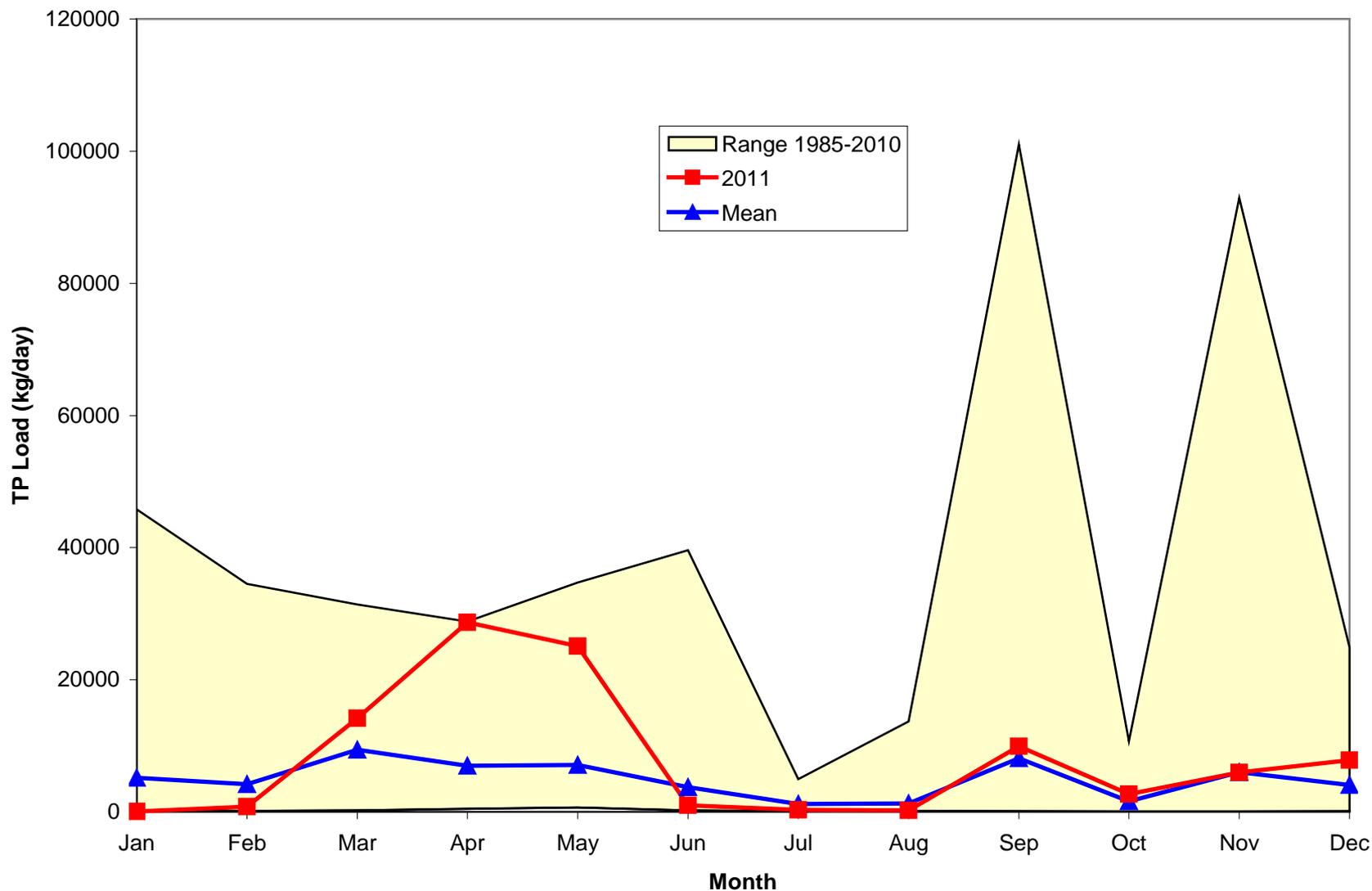


TP Loads at Chain Bridge increased 2011

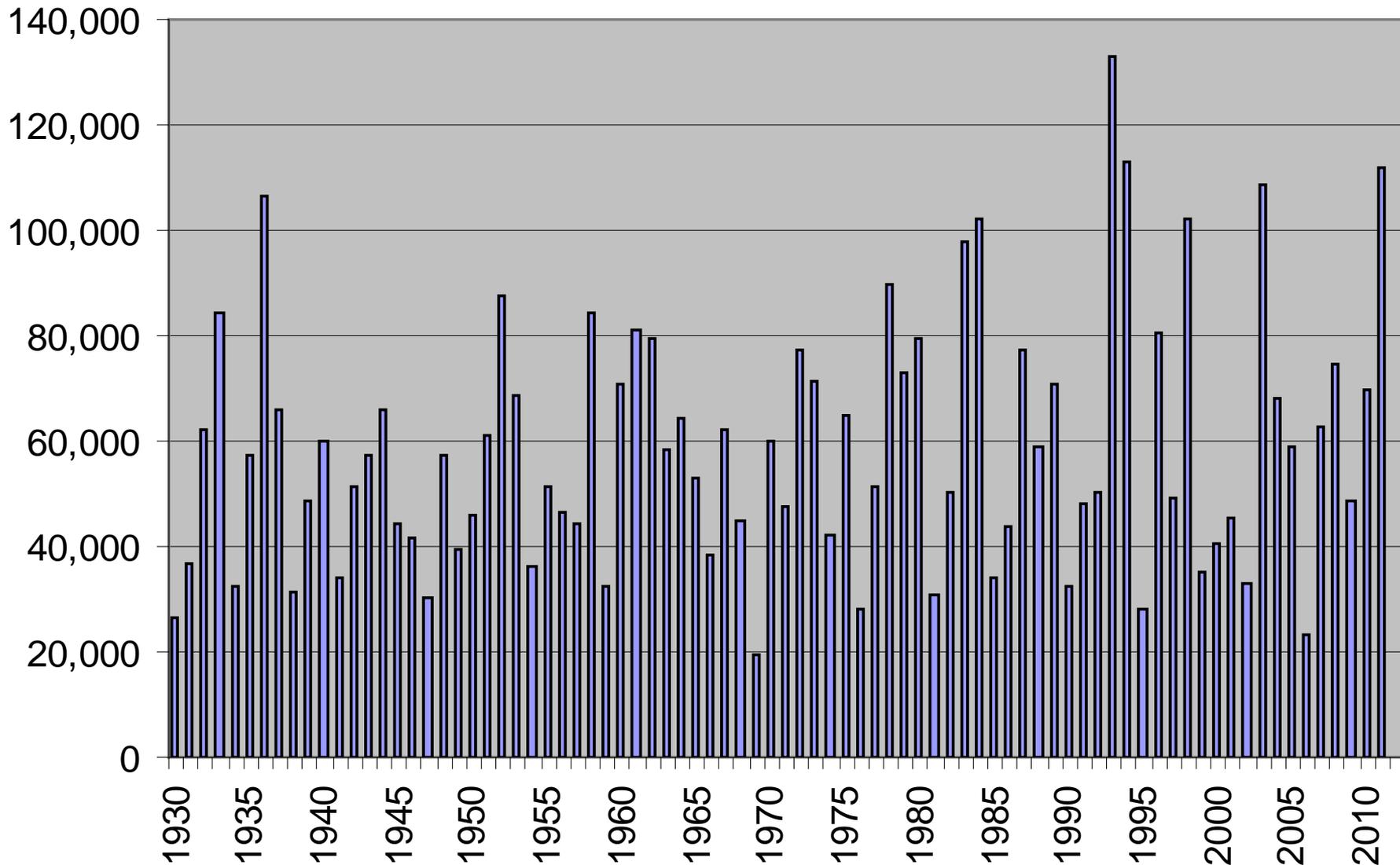
Annual total phosphorus loads at Chain Bridge
(1985-2011)



Total phosphorus loads at Chain Bridge for 2011 compared to range and mean for 1985-2010

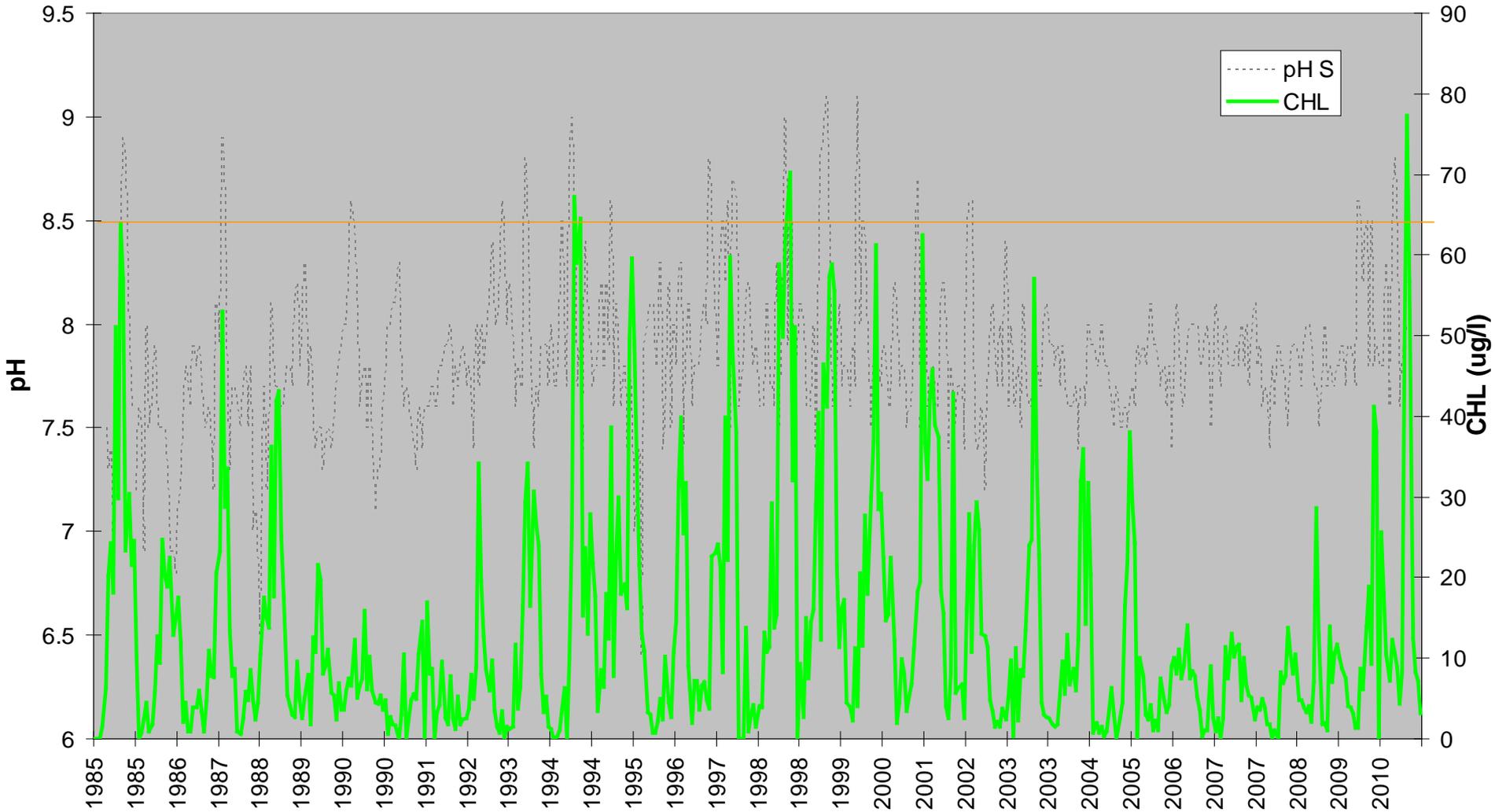


Third highest spring flow at Little Falls

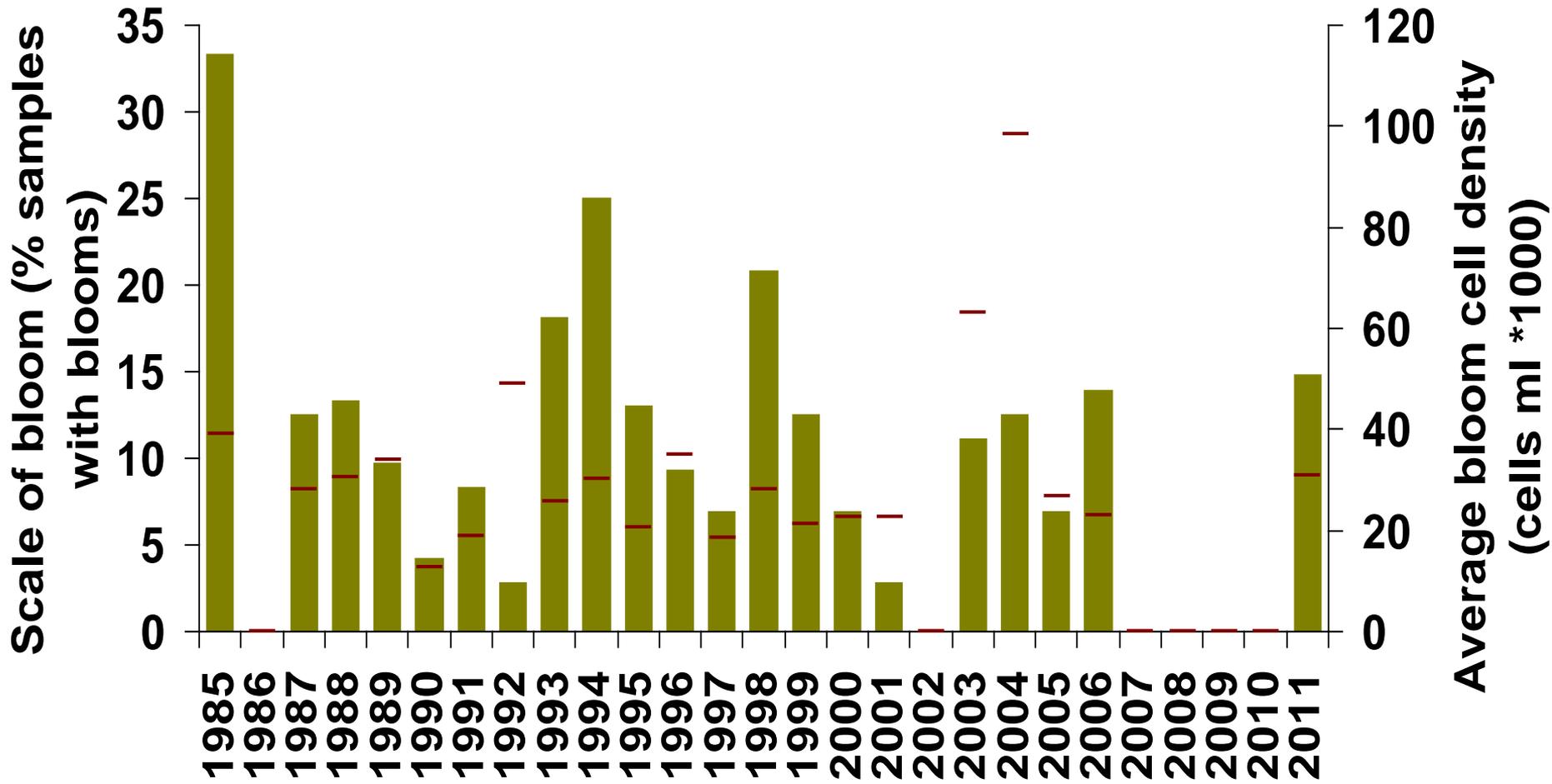


Chlorophyll at Indianhead highest recorded

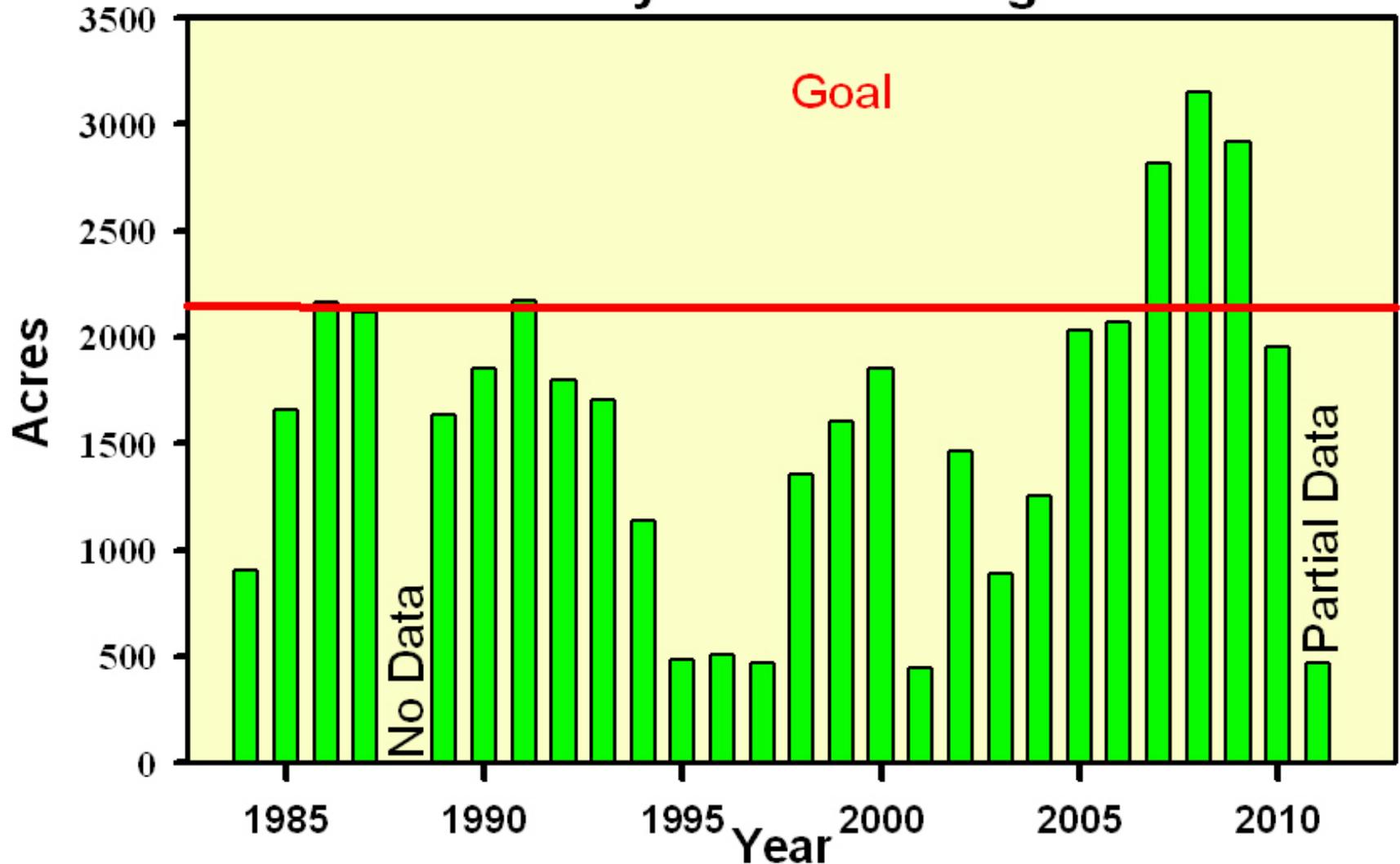
chlorophyll vs pH at Indianhead



Historic *Microcystis* on the Potomac



Potomac River Tidal Fresh (POTTF) Bay Grass Acreage



Total bluegreen declines at Indianhead

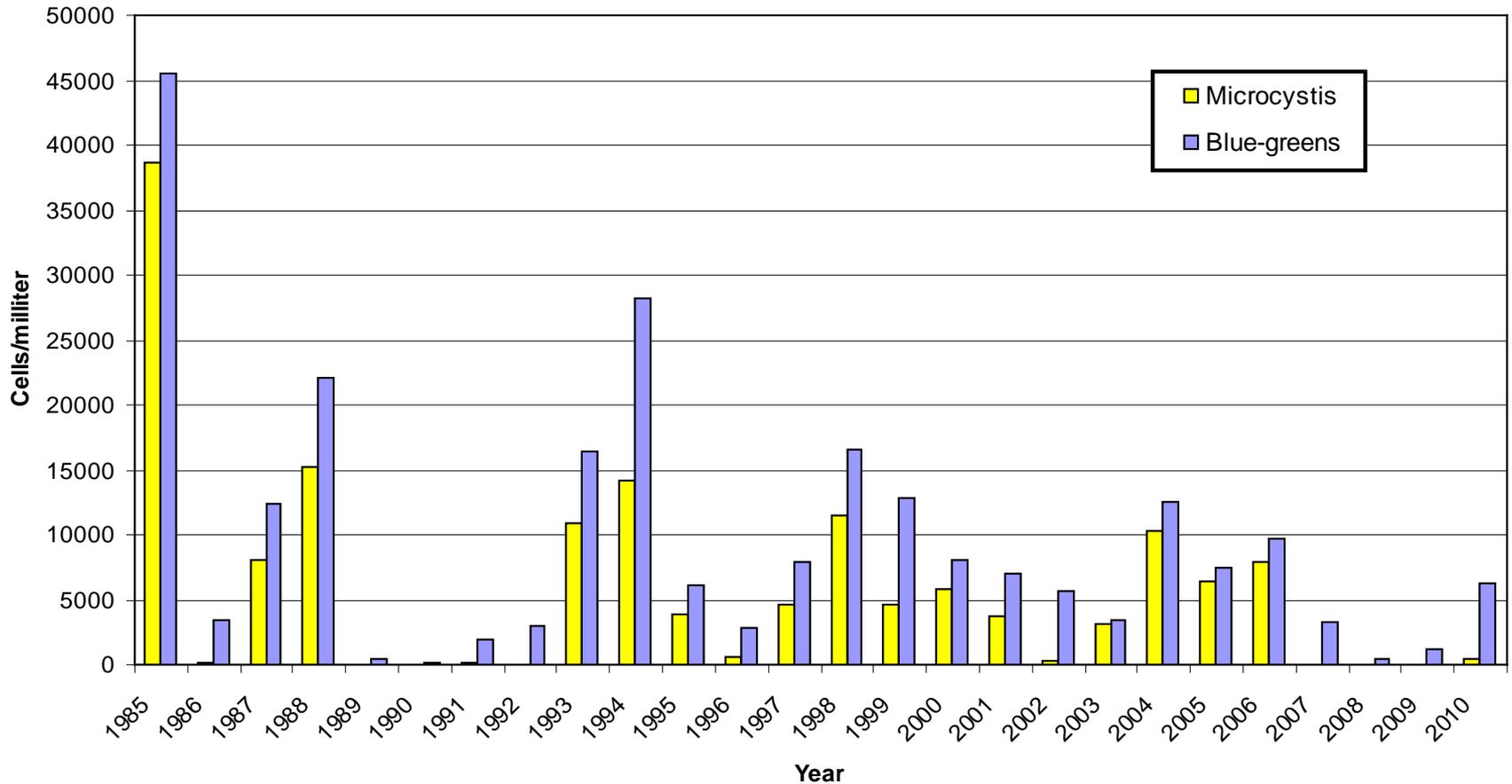


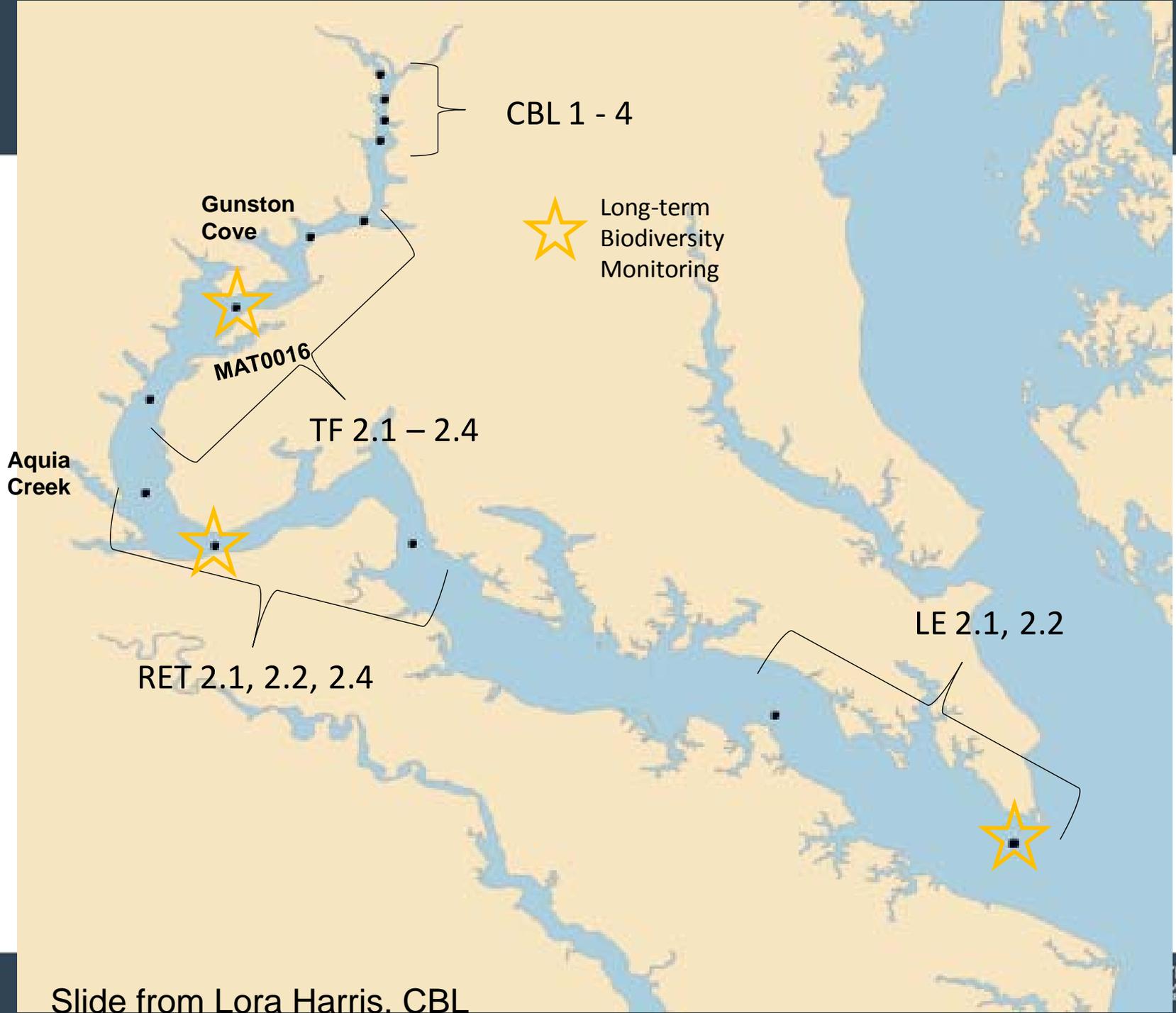
Figure 2. Historical time series(1985-2010) for summer mean concentration of Blue-greens (filaments,colony counts plus cells/ml of *Microcystis* and variable *Microcystis* (cells/ml.) Indianhead Station. (Summer= July, August and September)

2011 in review

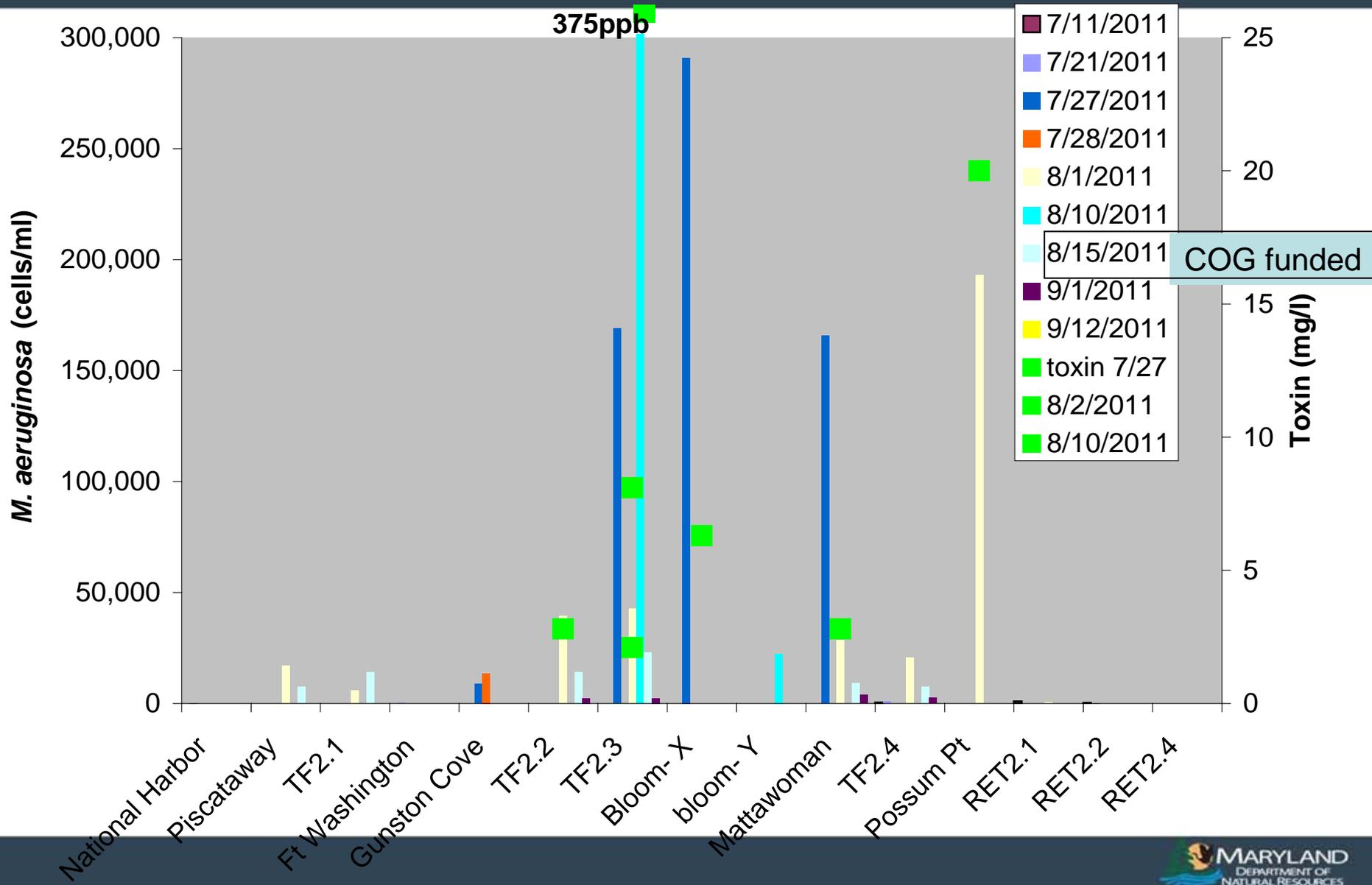
Timeline
distribution

Timeline of 2011 *Microcystis* bloom:

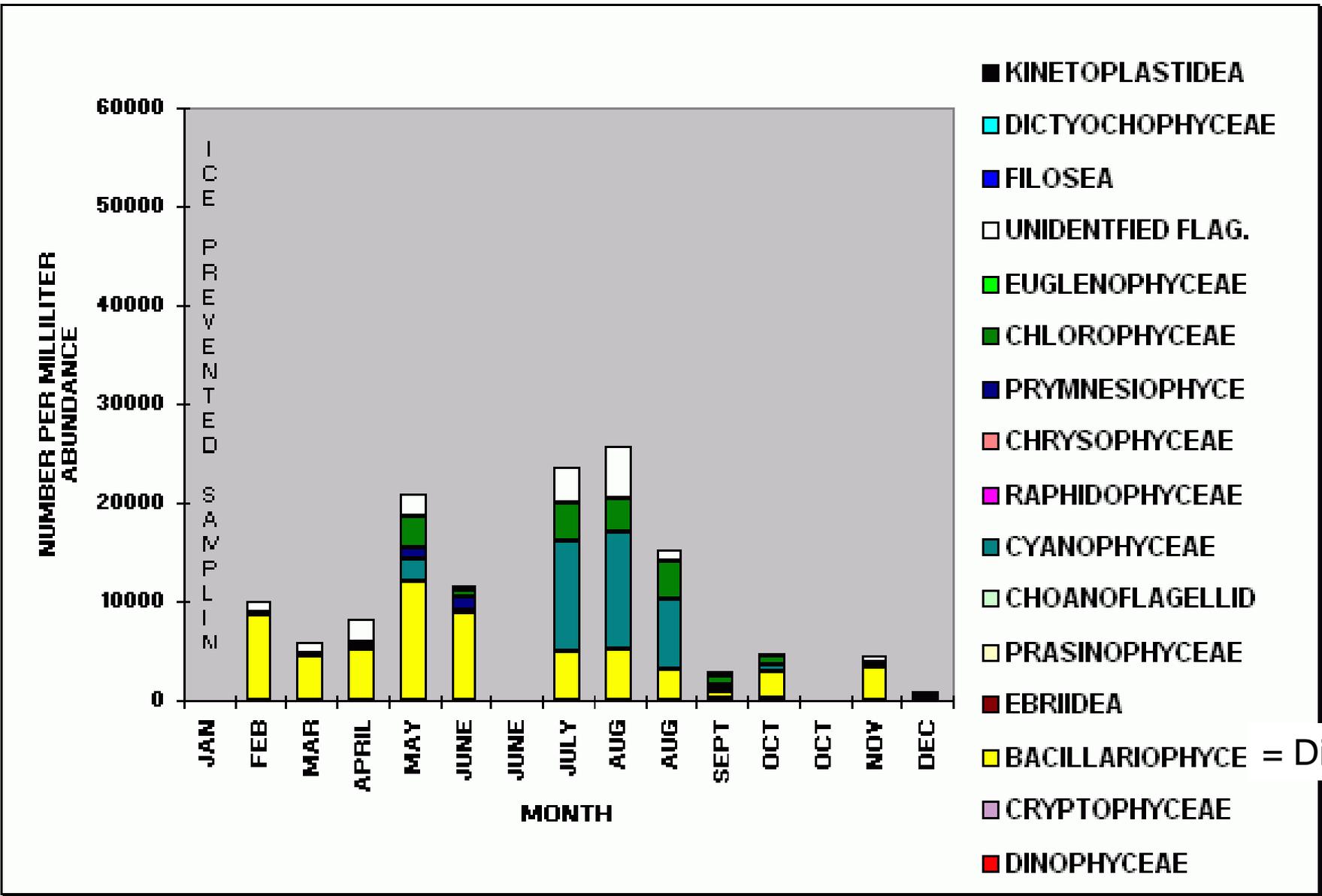
- 7/11 Routine cruise: <1,000 cells at TF2.4, RET2.2, RET2.4
- 7/19 *GMU reports* initial bloom at mouth of Gunston Cove
- 7/21 <1,000 cells at TF2.4, RET2.2 (oxford & NOAA samples)
- 7/25 Virginia puts health advisory out for Aquia Creek
- 7/27 *GMU samples*: **M.aerug >150K near TF2.3, MC <10ppb**
common Mattawoman >5K cells/ml; bloom appeared to be declining
- 8/1 EXTRA cruise added. 20-40K, Microcystin **toxin 20 ppb; 2 stations 8ppb**
Funded by COB *Ca & alkalinity
VA DEQ sampled Occoquan, Neabsco and Aquia
VA observed bloom Mattawoman Creek (MD)/Neabsco Creek (VA)
down to Chicamuxen Creek (MD)/ Quantico Creek (VA)
- 8/5 Charles County issues **health advisory** for mainstem
- 8/10 Indian Head sample (fisheries collected), ~1millions cells/ml; toxin **375ppb**
- 8/15 Routine cruise: <15K microcystis; new pres release noting decline in bloom
counts and toxin dropped to safe levels (3.9 and 2.1 ppb)
- 9/1 No obvious bloom following Hurricane Irene/ Tropical Storm Lee
CBL cruise micro <2,500 in mainstem 4K in Mattawoman
- 9/12 Routine cruise: no microcystis found



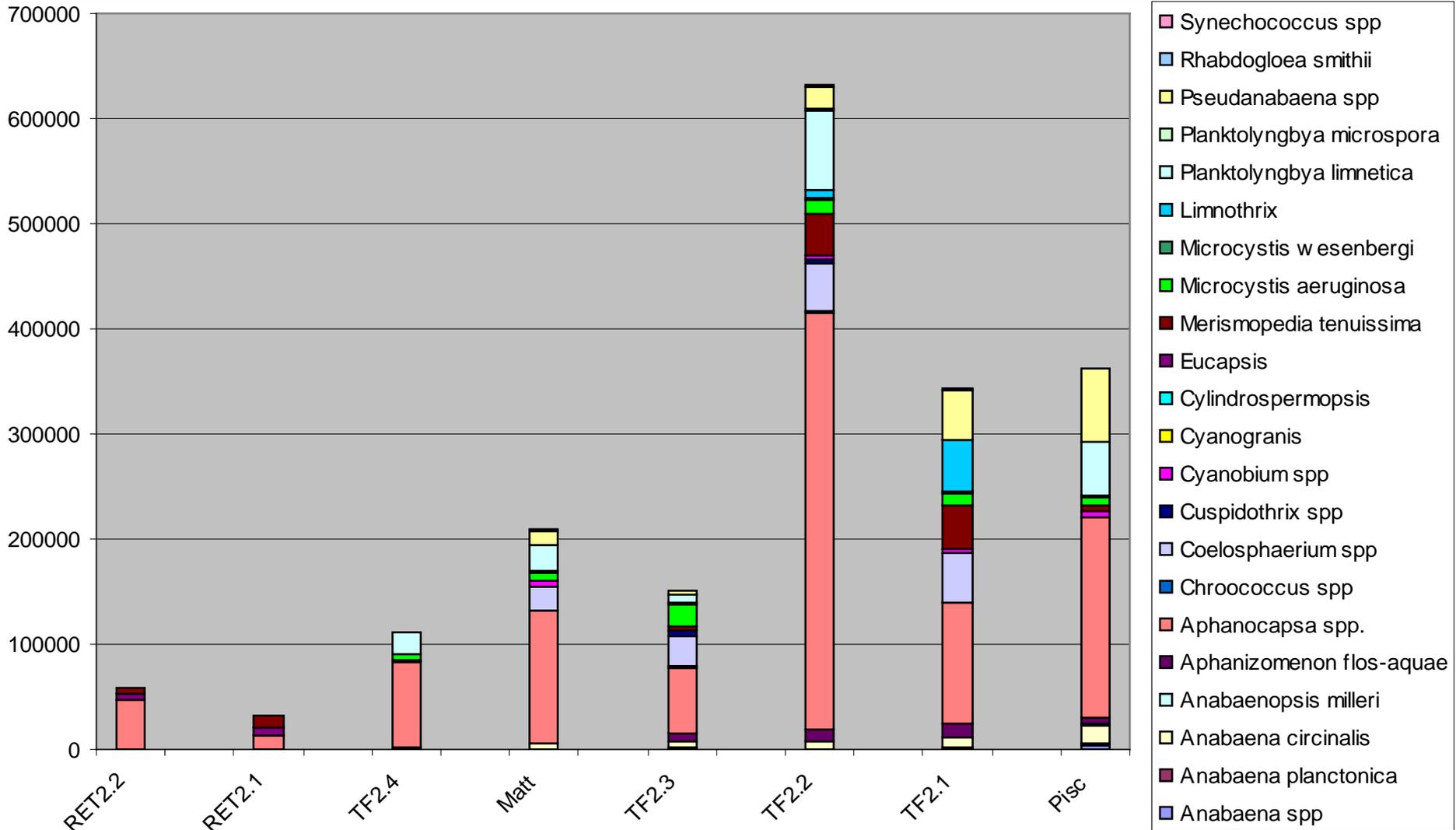
2011 *Microcystis* ~3 miles; 2 weeks



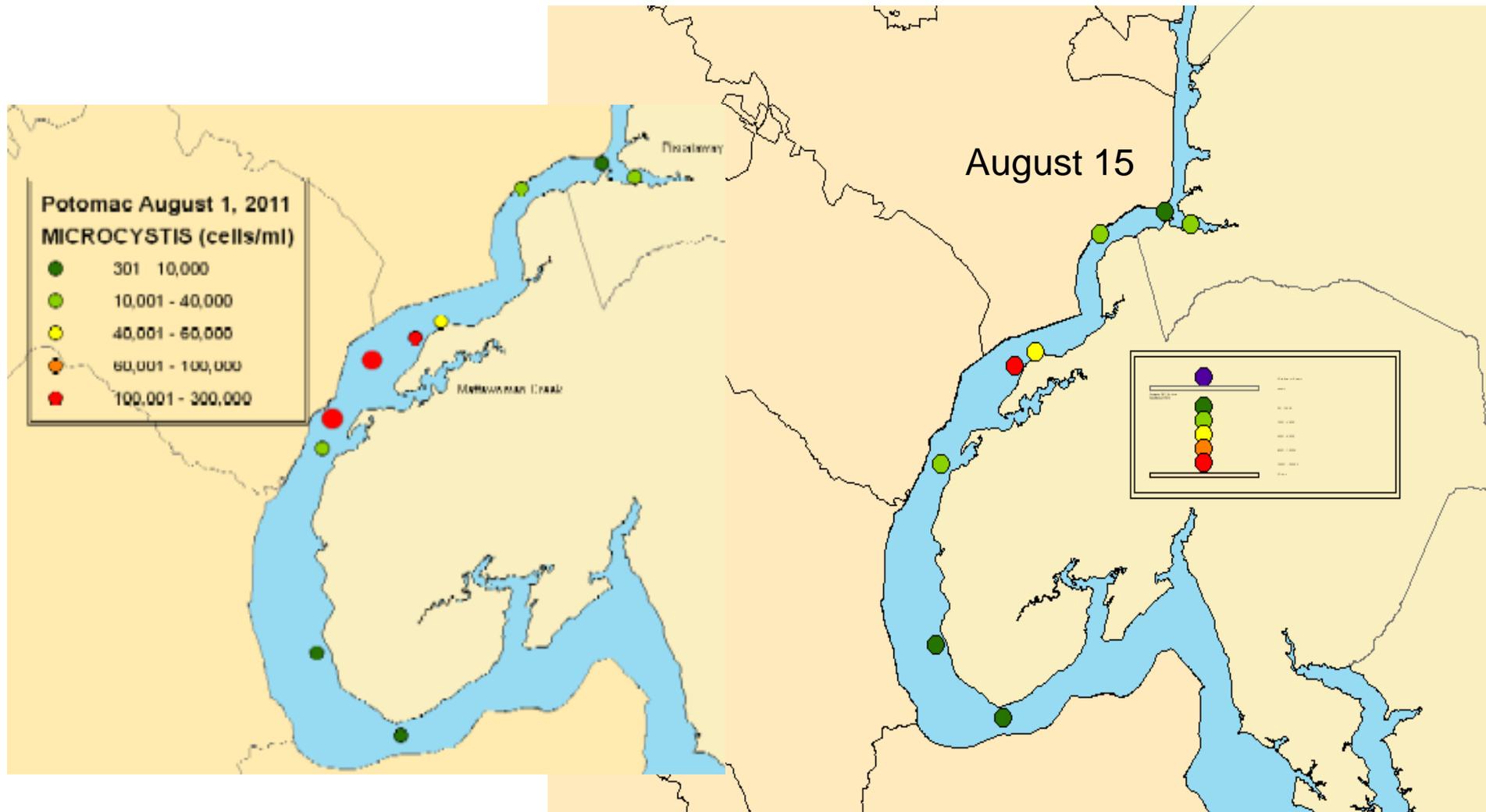
Phytoplankton community Indianhead- 2011



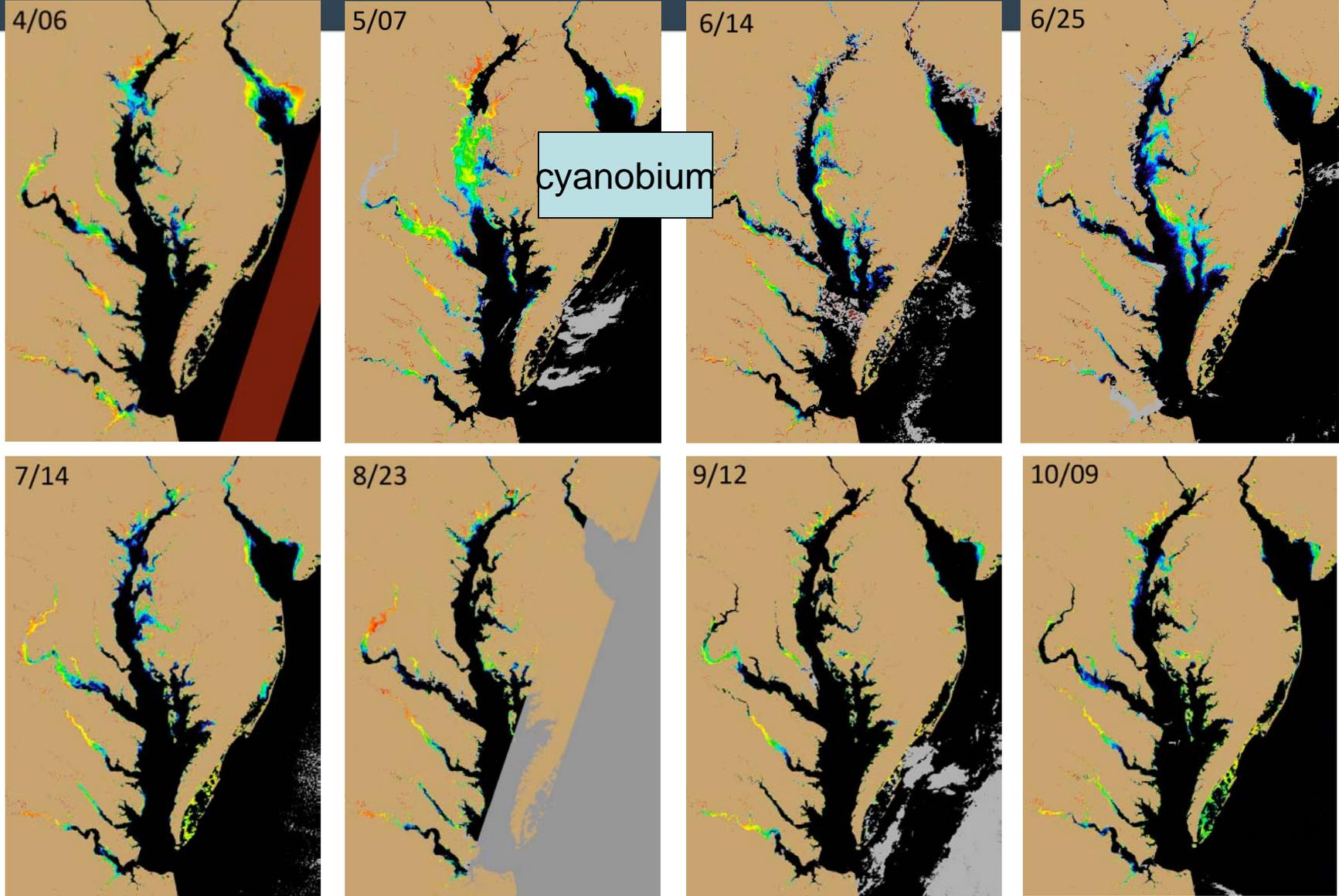
August 15- bluegreens



Spatial distribution of bloom



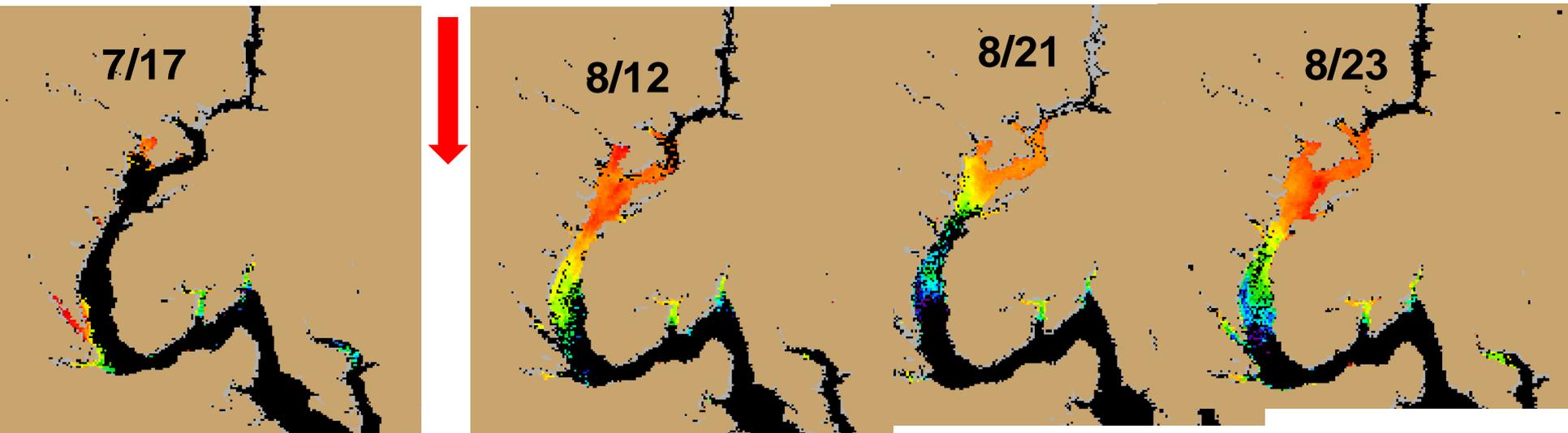
2011 CI (bloom) Algorithm Time Series



NOAA Satellite Tracking

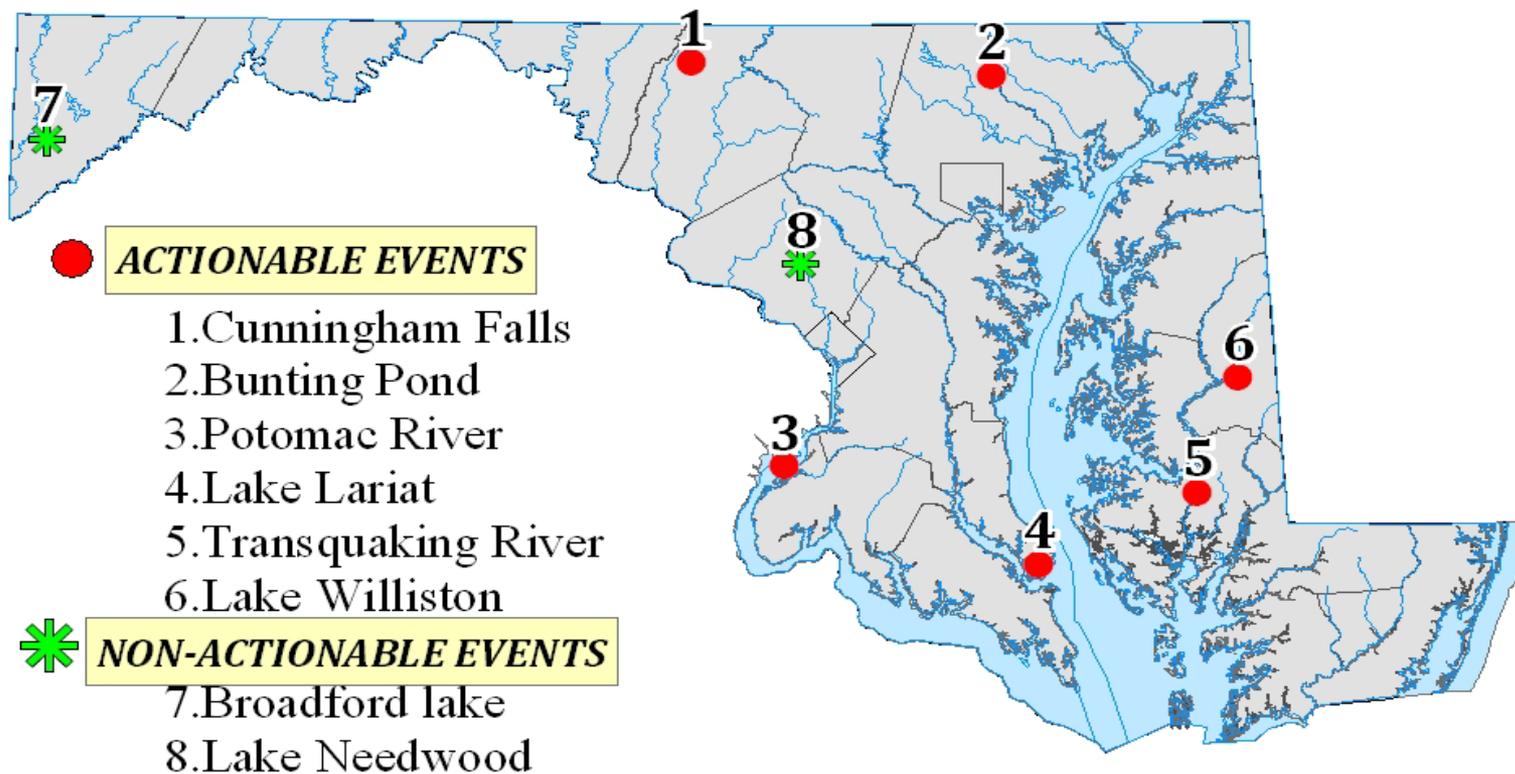
Improved CI

Loss of MERIS



New collaboration with MD-DNR, George Mason Univ. and NOAA
Phytoplankton Monitoring Network

MC ELISA 2011 Map

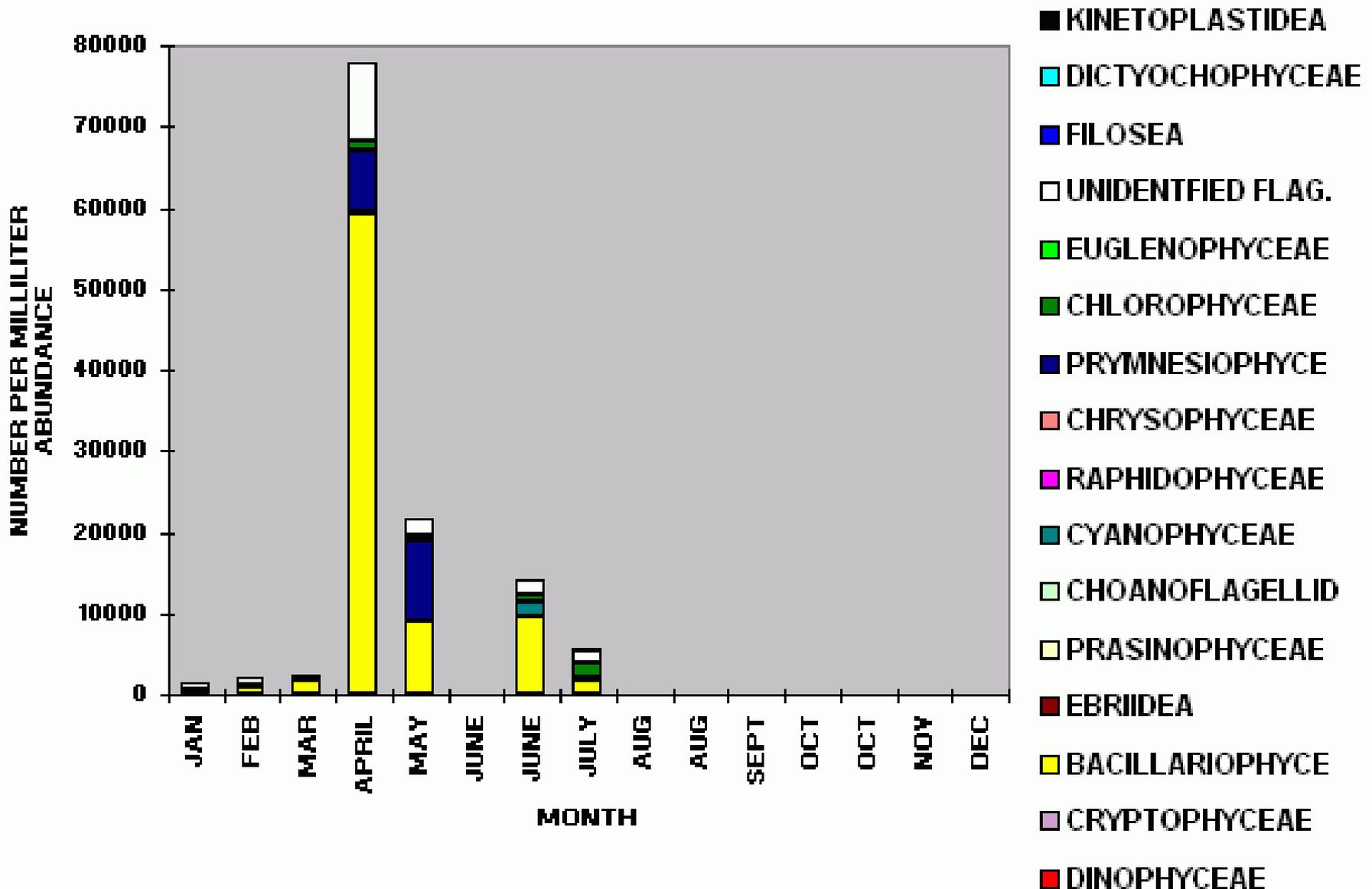


2011 cyanoHAB water contact advisories

Waterbody	County	Start	End	Duration (days)
Williston Lake*	Caroline	6/6	9/21 still blooming	>107
Cunningham Falls	Frederick	7/31	No additional sampling- Permanent post	?
Bunting Pond	Baltimore	7/14	No additional sampling	?
Transquaking- <i>Higgins Pond</i>	Dorchester	7/28	11/3	128
Potomac River	Charles	8/1	9/7	37
Lake Lariat	Calvert	8/16	permanent posting	?

* monitoring discontinued on Lake Williston after 9/21 because it was partially drained after tropical storm Lee and sampling was hazardous.

2012- no bluegreen blooms



How to Use This Site

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Monitoring Stories & Publications

What Does It Mean?

Lesson Plans

Links

Partners

Ask an Expert

BayStat

Maryland StreamHealth

Home Page

Harmful Algal Blooms

- EOTB said: @pwoodreporter That would be great. We're making some plans. Stay tuned. Official b-day was a Friday the 13th, Sept 2002. 16 hrs ago
- EOTB said: In September, Eyes on the Bay will be 10 yrs old! Check out the Bay Journal article from 2002. <http://t.co/8uu2Brv> 17 hrs ago
- EOTB said: DNR harmful algae bloom map updated through Aug 2. <http://t.co/cobzWks2> 5:51 PM Aug 6th

Click a station for more info and data

Harmful Algal Species

- Station sampled
- Potentially harmful Cyanobacteria
- Microcystis aeruginosa*

-Click Arrow to Expand Legend
-Checkbox Removes/Adds Layer

You are currently viewing data for 7/25/2012.

Select an end date of a sampling period:

- 08/02/2012
- 07/25/2012
- 07/18/2012
- 07/11/2012
- 07/03/2012
- 06/28/2012

Algal Concentrations (cells/ml)

Algae Encouragement Index

- S = percent sunshine
- W = wind velocity in m/sec
- LQ = common logarithm (base 10) of discharge in m³/sec

SUMMARY

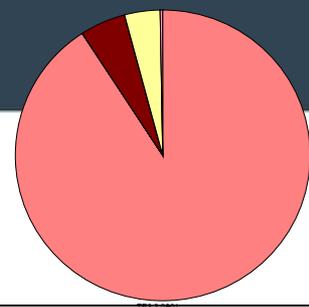
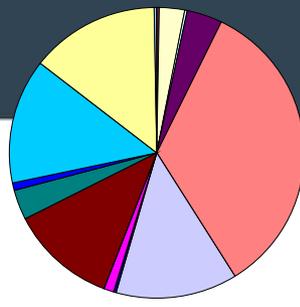
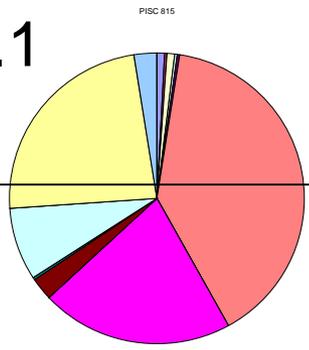
- Nutrient declines have led to decreased blooms.
- High spring inputs in 2011 set the stage for bloom.
- Toxin monitoring necessary.
- Other bluegreen algae important part of community.
- Get data to complete algal index
- continued coordination with COG and other partners – GMU, UMD, VA DEQ, MDE, DHMH
- 2012 – microcystis very low so far, next cruise Aug 13

- Anabaena spp
- Anabaena planctonica
- Anabaena circinalis
- Anabaenopsis milleri
- Aphanizomenon flos-aquae
- Aphanocapsa spp.
- Chroococcus spp
- Coelosphaerium spp
- Cuspidothrix spp
- Cyanobium spp
- Cyanogranis
- Cylindrospermopsis
- Eucapsis
- Merismopedia tenuissima
- Microcystis aeruginosa
- Microcystis wesenbergi
- Limnothrix
- Planktolyngbya limnetica
- Planktolyngbya microspora
- Pseudanabaena spp
- Rhabdogloea smithii
- Synechococcus spp

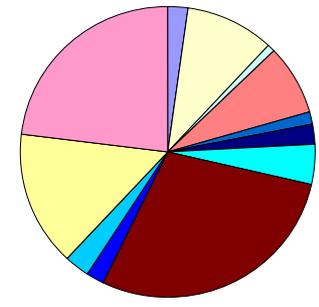
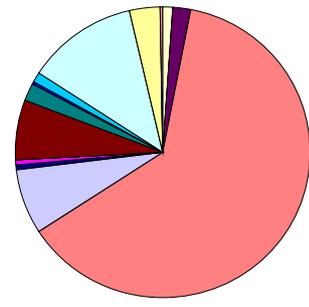
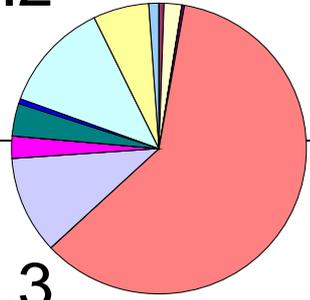
August 15

September 1

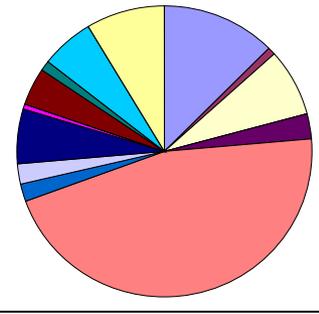
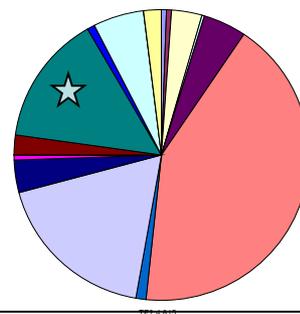
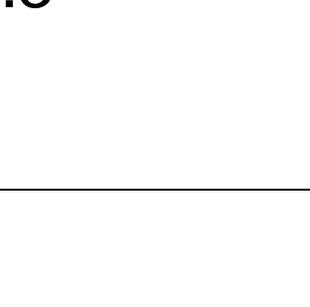
TF2.1



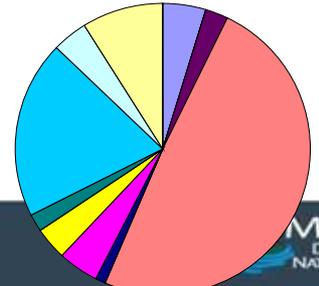
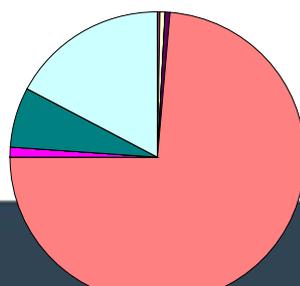
TF2.2



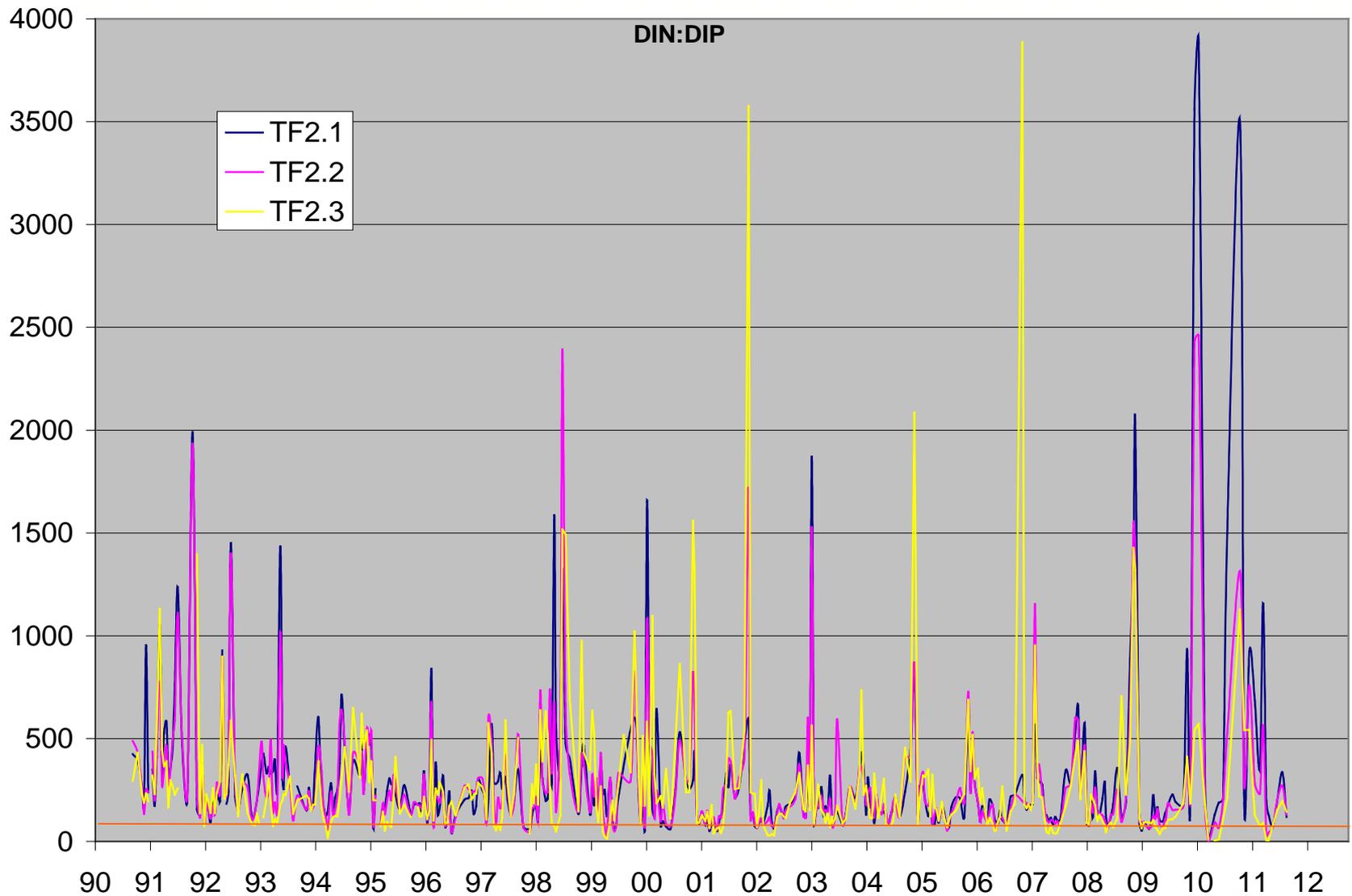
TF2.3



TF2.4

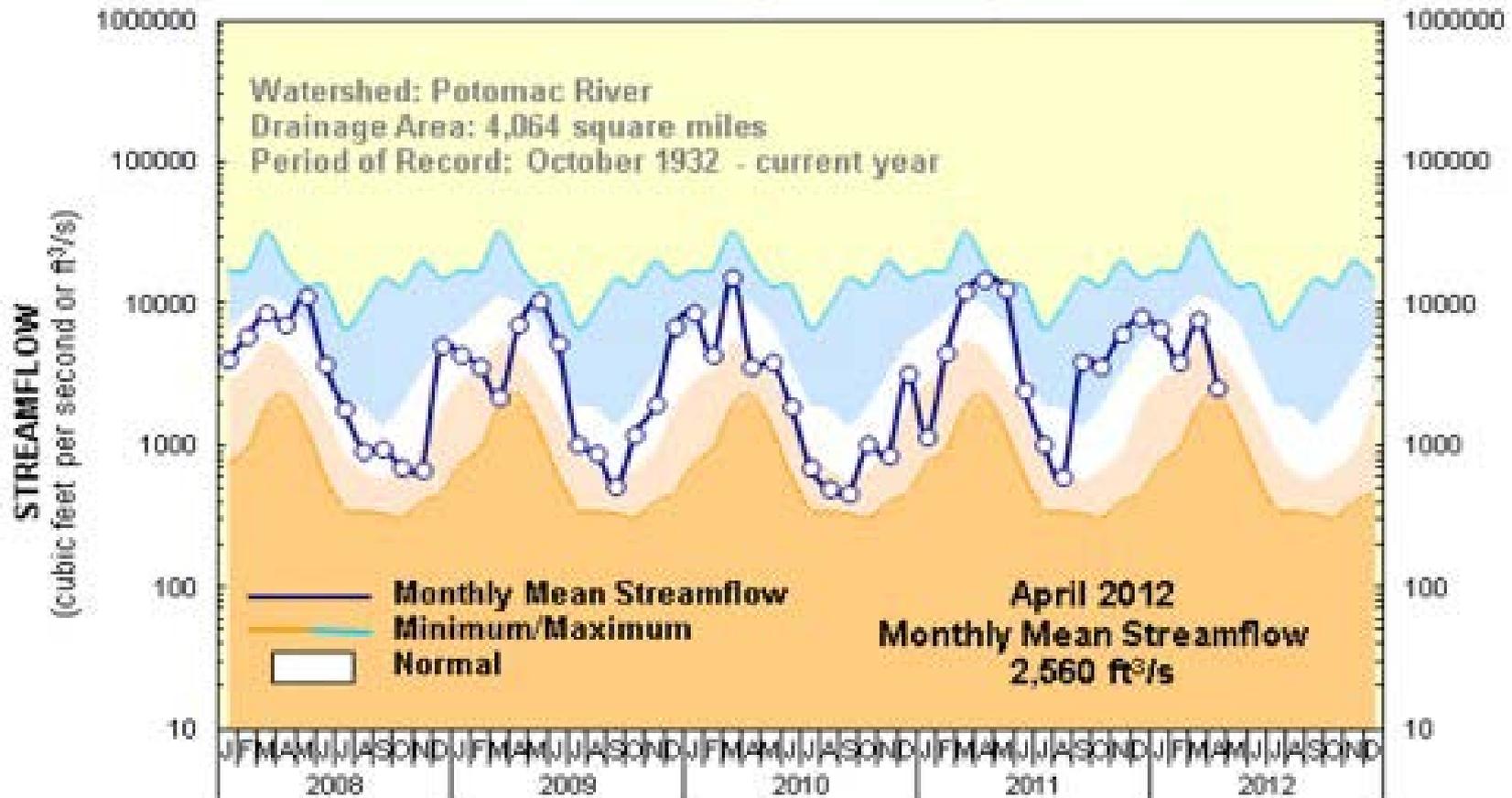


DIN:DIP ratio spike





01613000 Potomac River at Hancock Washington County, MD



Data from October 1, 2011 to present are provisional and subject to revision