

# 2013 Harmful Algae Bloom Pilot Project



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# World Health Organization (WHO) Guidance Values

Relative Probability of Acute Health Effects (Advisory Level)	Microcystin -LR (ug/L)	Total Cyanobacteria (cells/mL)
Low	<10	<20,000
Moderate	10-20	20,000-100,000
High	20-2,000	100,000-10,000,000
Very High	>2,000	>10,000,000

# HAB Toxin Testing



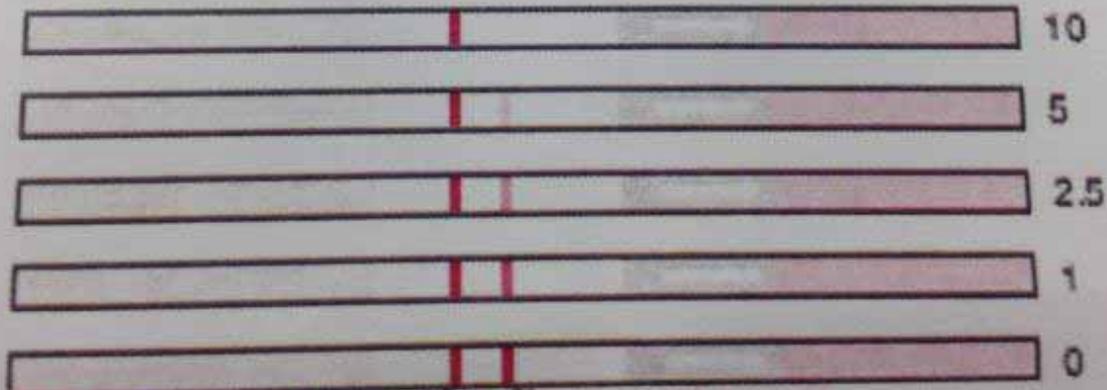
- Abraxis
  - Microcystin Strip test
    - ✦ One of many potential toxins
    - ✦ Limited use
  - Enzyme-Linked ImmunoSorbent Assay (ELISA) test
    - ✦ If >10 ppb, then sent to Iowa DNR



7-30-13  
Big Bend

completion of test.

E. Interpretation of Results



CONTROL LINE      TEST LINE

TEST INTERPRETATION

# Sample Handling / Analysis



## ➤ **ALL Routine Samples to Iowa DNR**

Quantitative analysis for for total microcystins/  
nodularins (ADDA) using ELISA

## ➤ **BLOOM Samples**

1. Strip Test - qualitative test

ND, 1 - 10  $\mu\text{g/L}$ , > 10  $\mu\text{g/L}$

2. If > 10  $\mu\text{g/L}$  → Iowa DNR

→ Notify Lake Owner

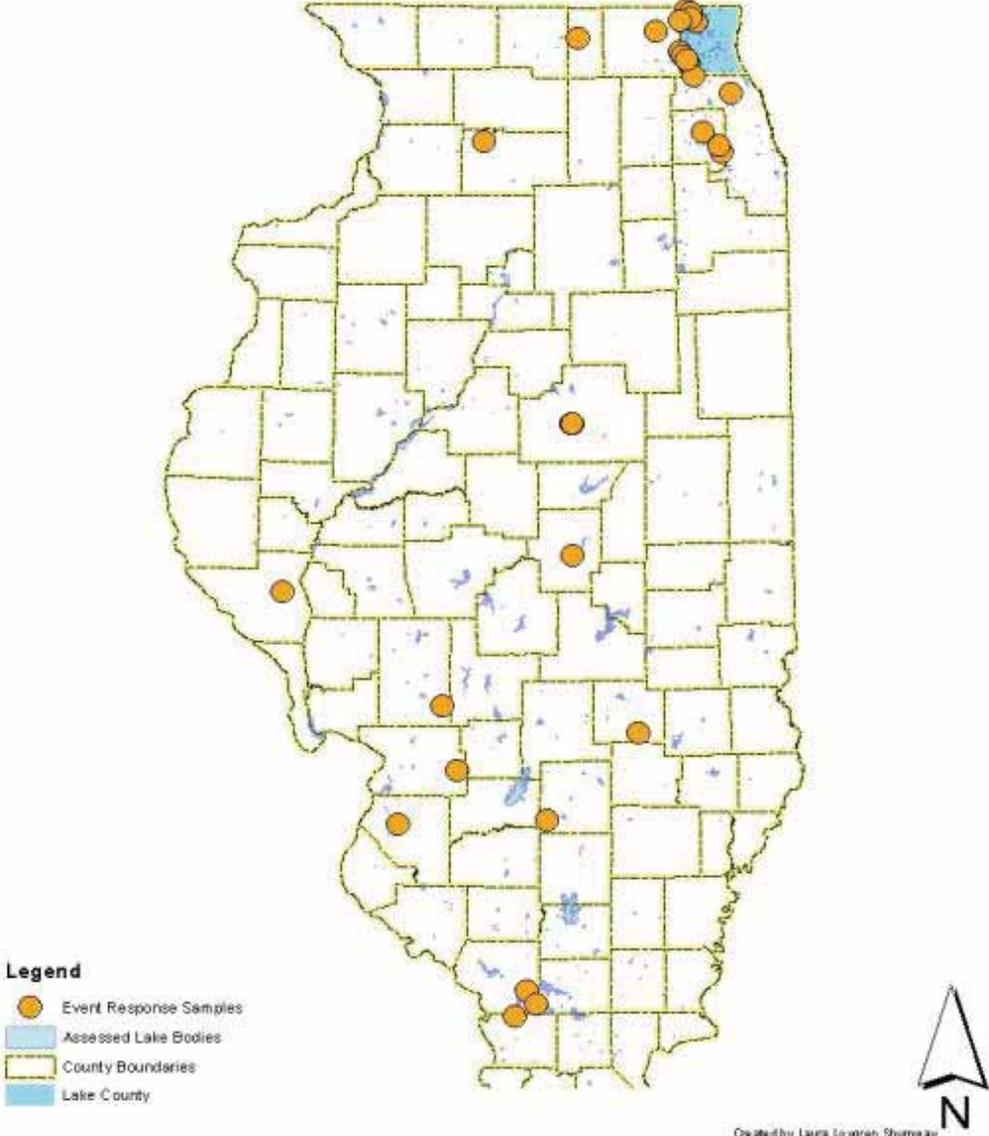
## 2013 Statewide HAB Plan Overview

### Routine Pilot Study:

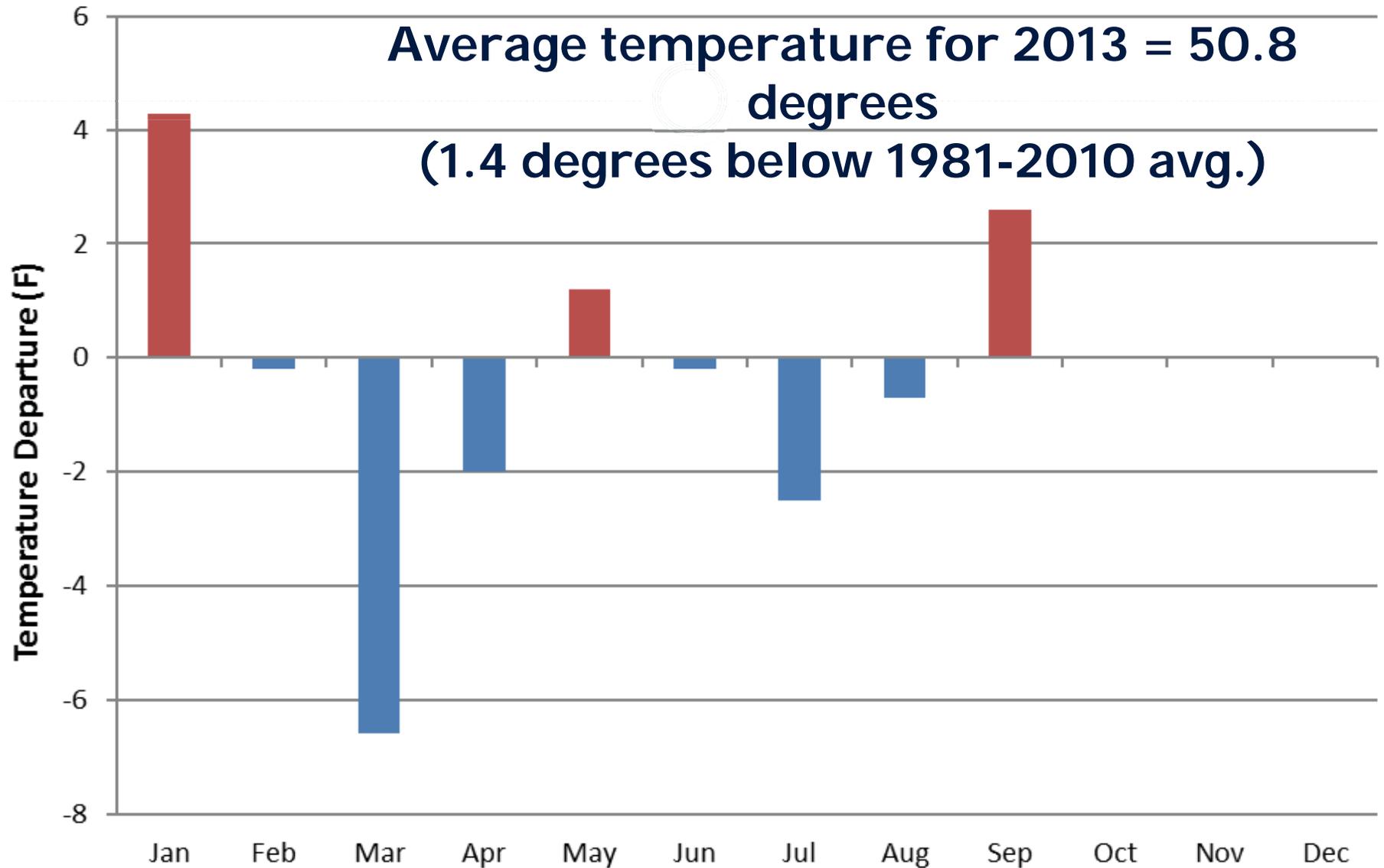


- **Beaches:** 30 Lake County inland lake beaches
- **Fox River:** DT-06, DT-22, DT-38
  - 5 X May - Oct
- **Lakes:** 10 ALMP lakes
  - 5X April - Oct
  - open water and public access sites

# 2013 HAB Program Event Response Sample Locations



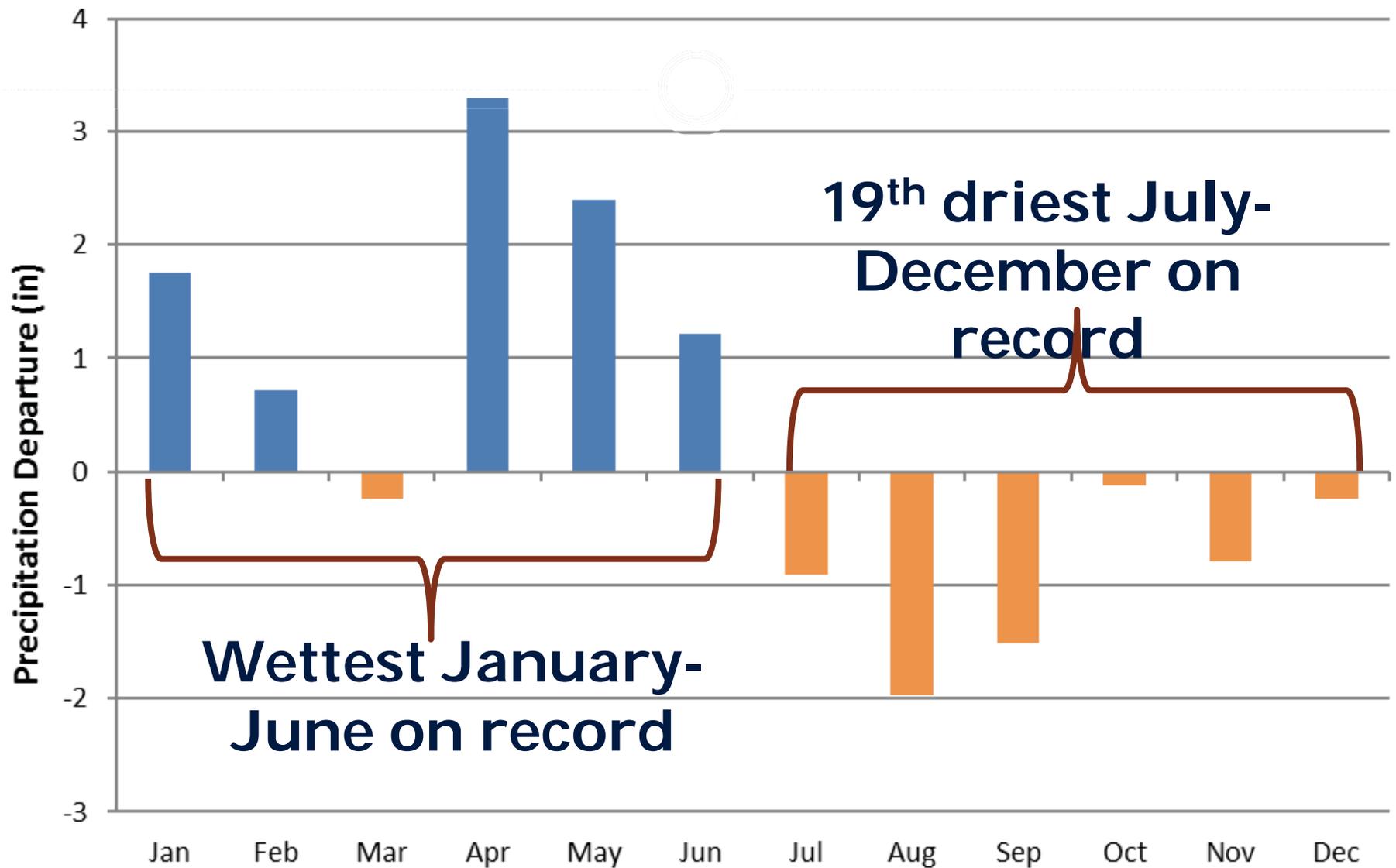
# Monthly Temperature Departure for Illinois



2013

(Illinois State Water Survey)

# Monthly Precipitation Departure for Illinois for 2013



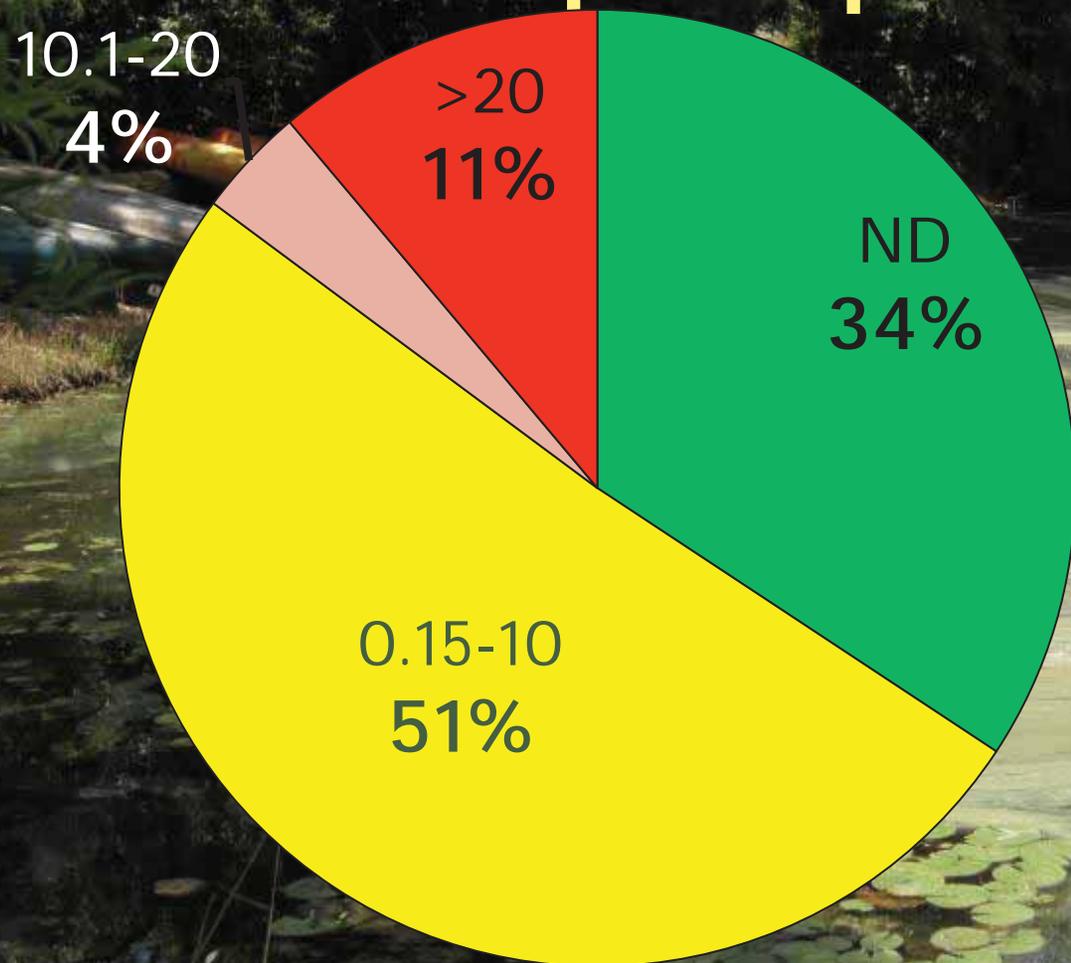
**Wettest January-  
June on record**

**19<sup>th</sup> driest July-  
December on  
record**

2013

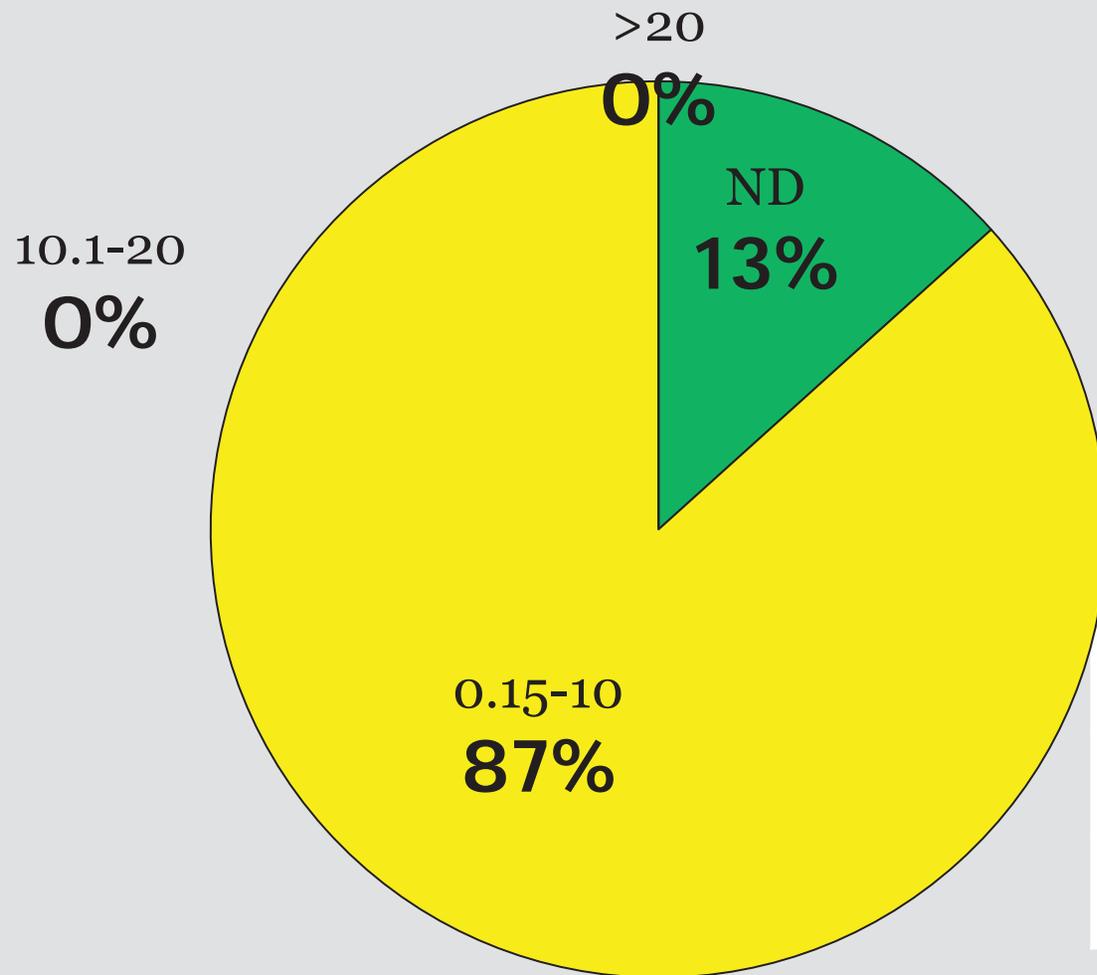
(Illinois State Water Survey)

# Microcystin Concentration ( $\mu\text{g/L}$ ) All Samples April - October 2013



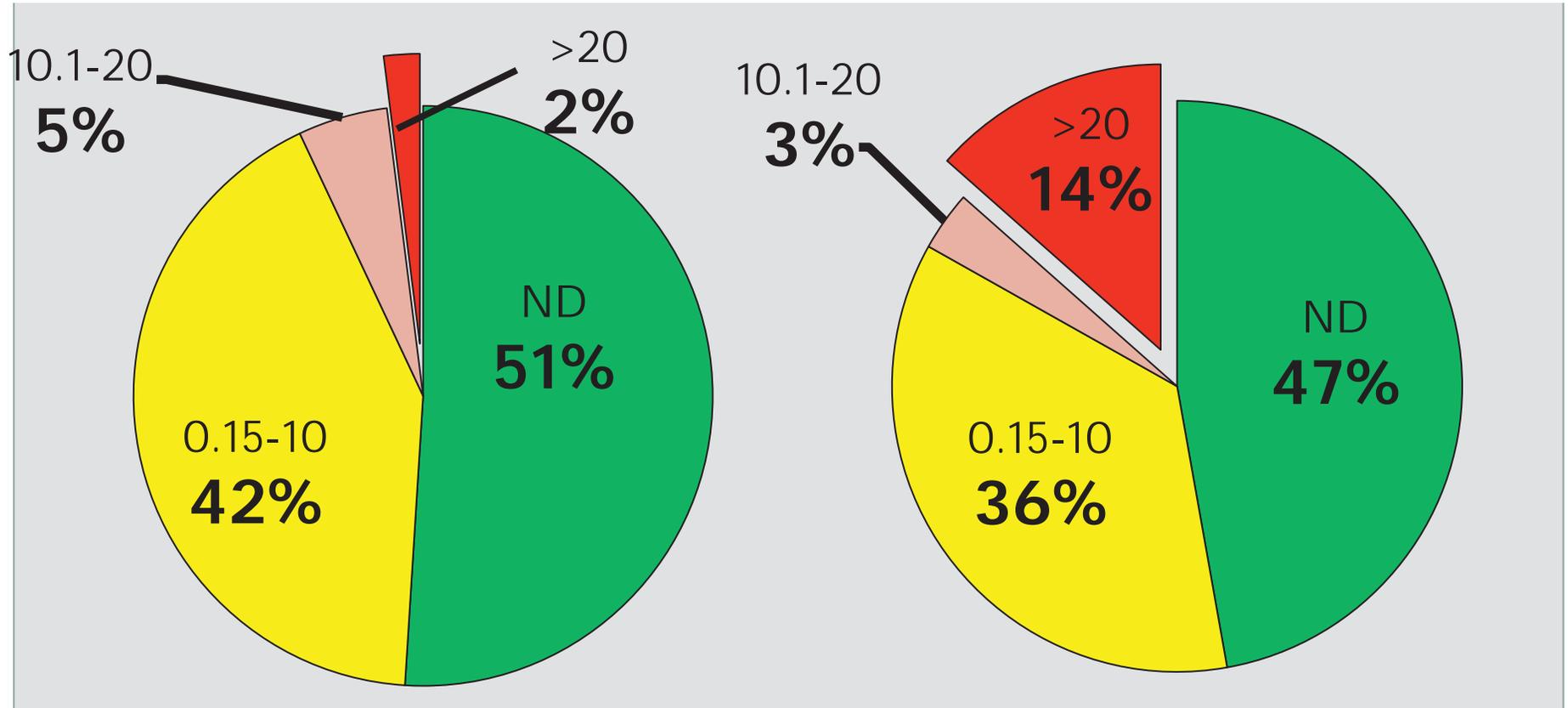
n	458
Median	0.37
Max	2,317

# Microcystin Concentration ( $\mu\text{g/L}$ ) Routine Fox River Samples - 2013



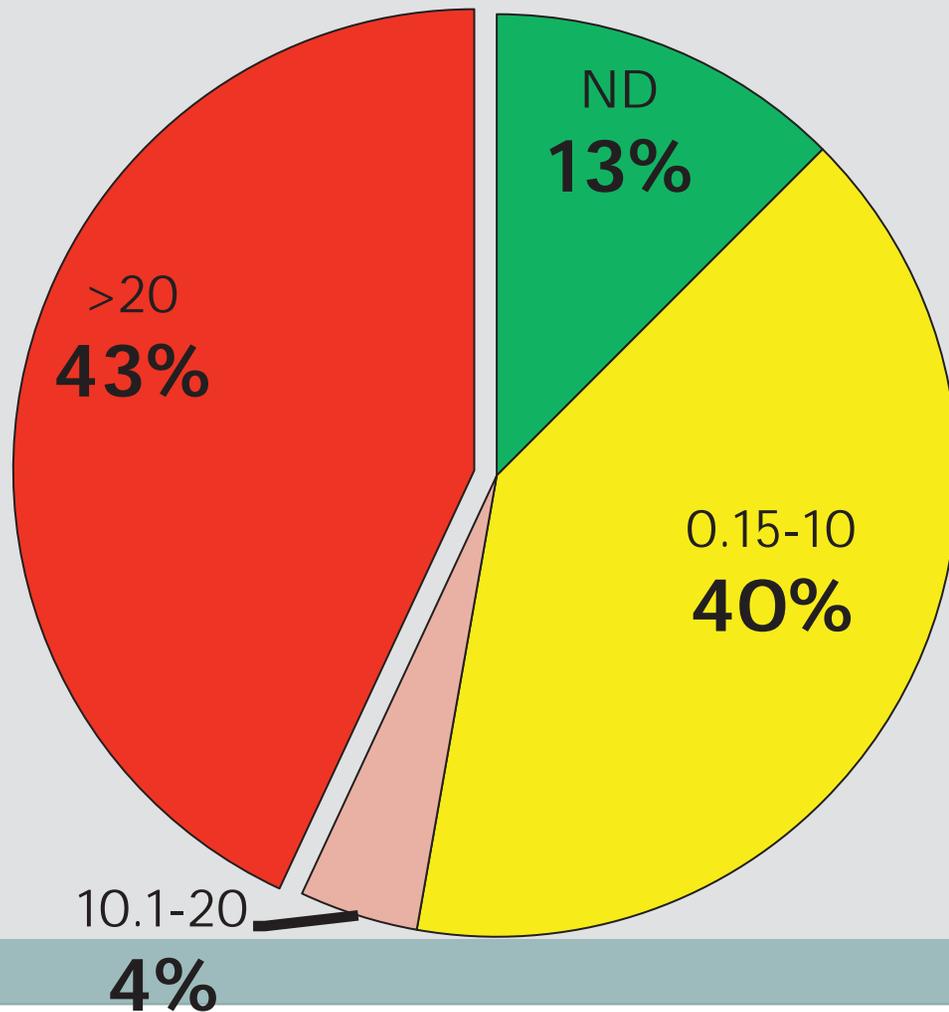
<b>n</b>	15
<b>Median</b>	0.6 $\mu\text{g/L}$
<b>Max</b>	5.3 $\mu\text{g/L}$

# Microcystin Concentration ( $\mu\text{g/L}$ ) Routine Lake Samples



Open Water	VS.	Near-Shore
100	n	89
0.00	Median	0.17
25.13	Max	2317.39

# Microcystin Concentration ( $\mu\text{g/L}$ ) Event Response Samples - 2013



n	72
Median	9.0
Max	2,278

# HAB Pilot Program – Lake County



## ○Event Monitoring

- Response from field staff, VLMP, and general public

## ○Routine Monitoring

- 30 licensed swimming beaches
- Sampled bi-monthly
- E. coli bacteria



# Tower Lake



# Tower Lake



# Tower Lake



- July 26, 2013
  - Abraxis: 2.5 ppb
- July 29, 2013
  - Abraxis: 5.0 ppb
  - BG estimate: 20,000 cells
  - ELISA: 8.23 ppb

- *Anabaena* sp.



# Lake Barrington



		<b>Beach</b>		
		<b>Abraxis (ppb)</b>	<b>BG Probe (cells)</b>	<b>ELISA (ppb)</b>
<b>3-Sep</b>		>10	300,000	581
<b>6-Sep</b>		>10	300,000	266
<b>12-Sep</b>		>10	-	134
<b>17-Sep</b>		2.5	-	9

# Lake Barrington



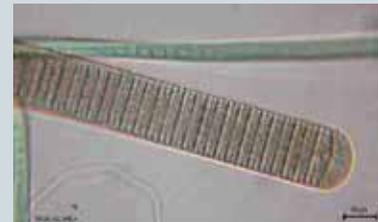
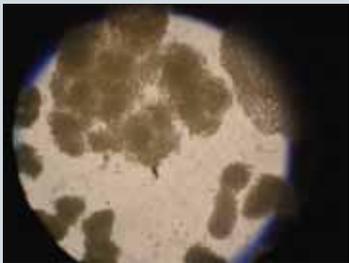
- September 17, 2013
  - Lake
    - Abraxis: >10 ppb
    - ELISA: 259 ppb
  - Morphology
    - 90.3 acres
    - 13 ft max depth
    - Impoundment



# Lake Barrington



- *Microcystis* and *Anabaena*
- Also, *Aphanizomenon* and *Oscillatoria*

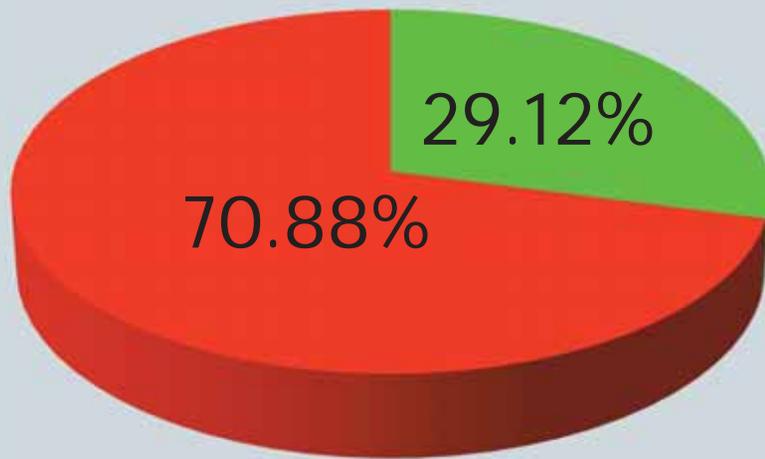




# Routine Beach Monitoring



HAB - Non Detect	53/182	29.12%
HAB > 0.15 ppb	129/182	70.88%



■ HAB - Non Detect

■ HAB > 0.15 ppb

28 of 30 lakes

# Routine Beach Monitoring



HAB 0.15 - 9.9 ppb	117/182	64.29%
HAB 10 -19.99 ppb	6/182	3.30%
HAB >10 ppb	12/182	6.59%
HAB >20 ppb	6/182	3.30%

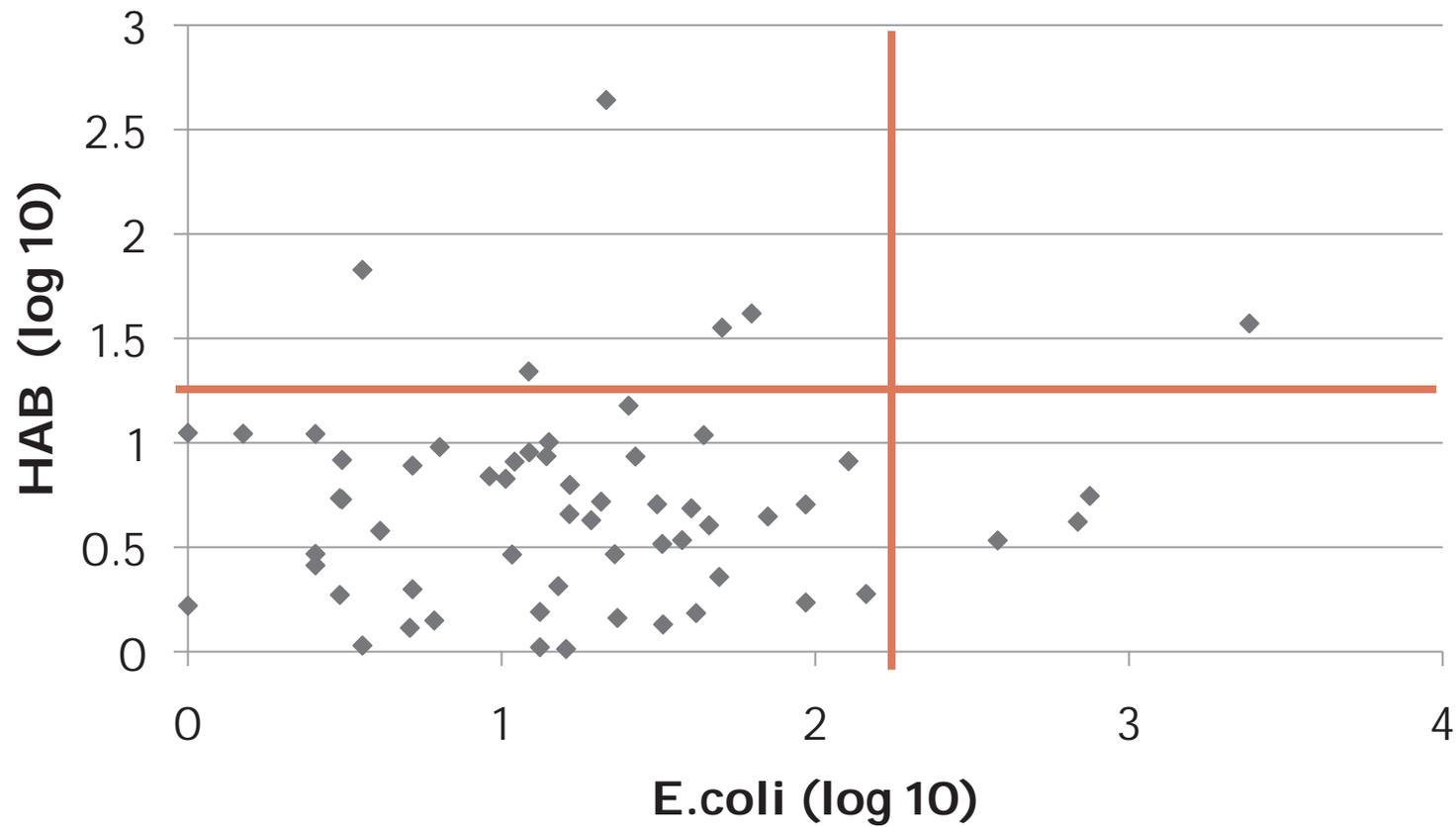
# Routine Beach Monitoring



E. coli >235 cfu	16/178	8.99%
HAB >20 ppb	6/178	3.37%
E. coli >235 + HAB >20	1/16	6.25%
HAB >20 + E.coli <235	5/6	83.33%



# Routine Beach Monitoring



# Routine Beach Monitoring

- Fish Lake Beach – 2013
  - No swim bans

Date	ELISA (ppb)	E.coli (MPN)
3-Jun	8.28	1
17-Jun	11.03	2
2-Jul	<b>21.98</b>	11
15-Jul	<b>35.61</b>	20
29-Jul	<b>41.65</b>	20
12-Aug	<b>67.37</b>	2



# HABs and Lake Impairments



<b>Lakes w/HAB &gt;20 ppb</b>	<b>TN:TP</b>	<b>TP (mg/ L)</b>
Loch Lomond	6:1	0.295
Lake Louise	11:1	0.156
Lake Barrington*	16:1	0.060
Slocum Lake*	16:1	0.152
Tower Lake*	19:1	0.083
Island Lake*	20:1	0.121
Wooster Lake*	21:1	0.068
Fish Lake	23:1	0.096
Dunn's Lake	24:1	0.095
Channel Lake	27:1	0.036
Cedar Lake*	52:1	0.020

\*assessed in 2013

# CDC Reporting & Literature



- Recreational Water–Associated Disease Outbreaks — United States, 2009–2010, MMWR 63 (01); 6-10, January 2014
  - “Of 24 outbreaks associated with untreated recreational water venues (e.g., lakes), almost half (46%) were confirmed or suspected to have been caused by cyanobacterial toxins.”
- Dodds WK, Bouska WW, Eitzmann JL, et al. Eutrophication of U.S. freshwaters: analysis of potential economic damages. Environ Sci Technol 2009;43:12–9
  - “Closing or not using U.S. freshwater lakes for recreational activities because of hypereutrophication (i.e., HABs) is estimated to cost \$0.37–1.16 billion per year”

# Acknowledgements

- **Jason McCurdy**, Iowa Department of Natural Resources Water Laboratory in Coralville, IA.
- **Lake County Health Department Environmental Services staff**
- **Holly Hudson**, Chicago Metropolitan Agency for Planning
- **Joe Rush**, JadEco, LLC
- **Surface Water and Field Operations Section of the Illinois EPA**
- **Volunteers!!**

<http://www.epa.state.il.us/water/algal-bloom/index.html>