2018 Forecast Western Lake Erie Cyanobacterial Harmful Algal Bloom

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With forecast results from
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Lake Erie July 2016
2017: (8) extensive cyanobacteria bloom

Maximum bloom
23 Sept 2017

Bloom density 23 Sep 2017

Sep 22, Maumee River, Toledo, NOAA/GLERL
2017 Forecast: 8 severity

Large and consistent with forecast

Western Lake Erie
Bloom severity

2017 severity 8
ensemble forecast 7
model values 6.6 - 8.7
uncertainty 5.5 - 9

max
min
Forecast, Stone Lab, July 12, 2018

NOAA Coastal Ocean Science

Peak bloom extent from satellite 2002-2017

Lake Erie peak bloom severity from MERIS (ESA) and MODIS (NASA)
2018 Ensemble of six models

• NOAA: P2, and NOAA-TBP
  • P2 is mechanistic, NOAA-TBP is Empirical statistical-heuristic using discharge and bio-available P from March to early summer

• UMich/NCSU/GLERL-Bayes
  • empirical Bayesian model relating spring phosphorus loading to multiple estimates of HAB size

• LimnoTech WLEEM and Response Load
  • Process-based Fine-scale 3D linked hydrodynamic-sediment transport-advanced eutrophication model

• Carnegie/Stanford
  • Linear statistical model based on April-July and decadal cumulative DRP
Little change over July, weather systems favor dry, slightly over 300 m.tons of phosphorus
2018 Ensemble Forecast

2018 Western Lake Erie Bloom severity forecast

NOAA
Heidelberg Univ.
U.Mich-NCSU-GLERL
LimnoTech
Carnegie-Stanford

forecast 6 (5 - 7.5)
models 4.9 - 7.8
uncertainty 4 - 8.5

NOAA Coastal Ocean Science
Forecast, Stone Lab, July 12, 2018
2016 moderate bloom (3.2) compared with 2017 (8)

Maximum extent
Sep 23 2017

Bloom density
Sep 20-26 2017

Bloom density 2016

Aug 18
NASA MODIS Terra

NOAA Coastal Ocean Science
Context: Even a bad year like 2013, The worse did not reach islands (or central basin)

No problem for Perry Bicentennial!

Sep 02, 2013
Jeff Reutter
Conditions vary greatly in the lake, even between similar years.

Sep 17, 2008

Sep 12, 2010
Sentinel-3a (Ocean Land Colour Imager, OLCI): Increased use this year. First new satellite since we started in 2009

Launched in 2016 by European Space Agency for European Union Copernicus project

Sentinel-3b with OLCI launched in April, every day next summer!
OLCI used more frequently, improvements in data (calibration updates, etc.)

The grid used to model Lake Erie currents
Monitor the lake with the NOAA Lake Erie Bulletin 10th year, and 2nd year of official NOAA product.

Lake Erie Harmful Algal Bloom Bulletin
29 June, 2018, Bulletin 03

Analysis
Cyanobacteria is present in Lake Erie at low concentrations. *Microcystis* is present in the Maumee Bay area of the lake. Satellite imagery (6/28) indicates detectable concentrations in Maumee Bay, alongshore the Ohio Coast east of the Maumee River mouth, and offshore from North Maumee Bay to Brest Bay, extending past West Sister Island. *Keep pets and yourself out of forming*. Measured toxin concentrations are still below recreational thresholds throughout the bloom extent. As always, if you encounter any cyanobacteria bloom in Sandusky Bay or elsewhere, please report it to the GLN. Cyanobacteria bloom in Sandusky Bay is present in Lake Erie.

The images below are "GeoPDF". Please visit https://go.usa.gov/xReTC for instructions on viewing longitude and latitude.

Figure 1. Cyanobacterial Index from modified Copernicus Sentinel 3 data collected 28 June, 2018 at 11:23 EST. Grey indicates cloud cover.

The estimated threshold for cyanobacteria detection is 20,000 cells/ml.

costalscience.noaa.gov/research/habs/forecasting
Lake Erie is warmer this year

Lake Erie Average Great Lakes Surface Environmental Analysis (GLSEA)
Surface Water Temperature Compared to Current Year

(http://coastwatch.glerl.noaa.gov)

- Average 1992 – 2017
- 2018

NOAA Coastal Ocean Science
Forecast, Stone Lab, July 12, 2018
Early warming, may start bloom early but does not mean a worse bloom

**Microcystis** (cyanobacteria) grows in warm water, but is limited by the amount of phosphorus.
2018 Forecast

severity 6 bloom (5 – 7.5 likely range).
smaller than 2017 large (8) bloom.

Warm water does not mean a bigger bloom. Phosphorus is critical.
Bloom impact on western basin varies with wind.

Much of the lake will be fine most of the time.

Updates from Bulletin (and other sources)