NOAA Western Lake Erie Harmful Algal Bloom Seasonal Assessment

1 November 2021

2021 bloom severity and analysis: The 2021 Lake Erie cyanobacterial bloom had a severity index (SI) of 6.0 which is considered moderately severe. The SI captures the amount of bloom biomass over the peak 30 days of the bloom and is calculated using satellite imagery to assess both bloom biomass and spatial extent. The bloom was slow to develop (late July), and reached a peak from late August to early September, mostly in U.S. waters. The bloom weakened in mid-September, following several days of strong winds (>20 mph). After a period of calm winds and seasonally warm waters, the bloom re-intensified near the Michigan coast at the end of September. The bloom lasted longer than recent years, through the end of October, which was likely due to persistent warm water temperatures.

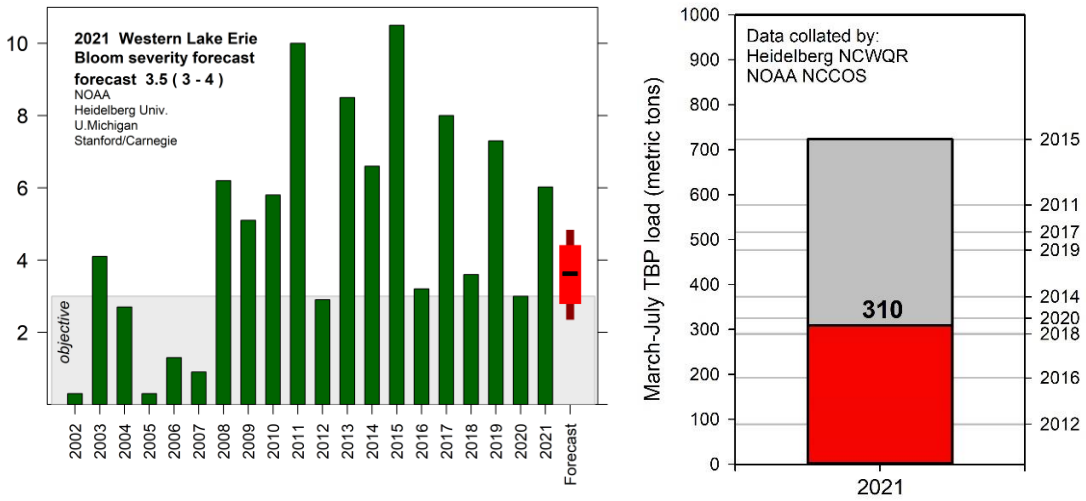

Figure 1. (Left) Bloom severity index (SI) for 2002-2021, and the forecast SI for 2021. The 2021 forecast ensemble range appears as red vertical bars. (Right) Total Bioavailable Phosphorus (TBP) load from the Maumee River for 2021 (red bar, 310 metric tons) and previous years for March-July. The grey bar corresponds to the highest recorded load (from 2015). TBP load data from: Heidelberg University, National Center for Water Quality Research.

At its peak, the bloom covered 530 square miles. This large area may have resulted from the heavy rain and associated high river discharge in July which may have dispersed nutrients further into the western basin. The concentration (biomass) of algae within the bloom was moderate, resulting in less extensive scum than has been seen in previous years. Toxins (microcystins) were detected throughout the bloom, although at lower concentrations than some recent years.

Comparison to prior years: The bloom was more severe than in 2020, which had a severity of 3.0. The size of the 2021 bloom was large, comparable in spatial extent to the severe blooms in 2017 and 2019, but overall had a lower bloom density.

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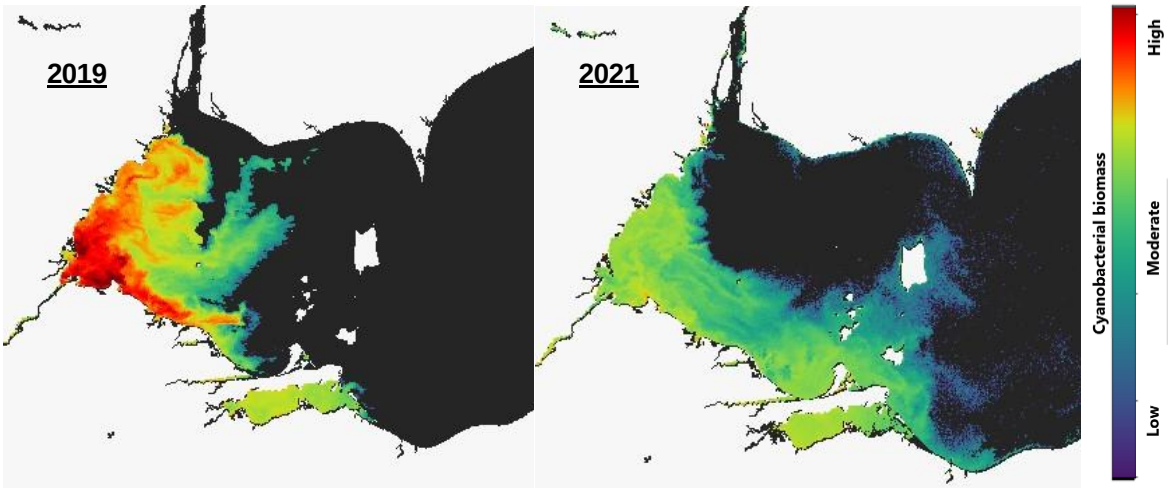

Figure 2. The *Microcystis* cyanobacteria bloom biomass in western Lake Erie showing differences between peaks in 2019 and 2021: (Left) Jul 30-Aug 08, 2019 and (Right) Aug 30-Sep 08, 2021. The images used data derived from the Copernicus Sentinel-3 mission provided by EUMETSAT. Blue indicates low concentrations that would not be immediately obvious to the eye. Areas that are red had greater likelihood for scum formation. 2021 was much less intense and reached the maximum bloom extent a month later than 2019.

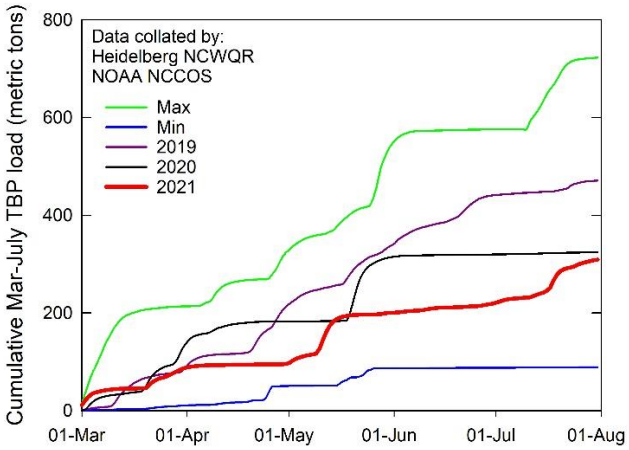

Figure 3. Cumulative Total Bioavailable Phosphorus (TBP) for the Maumee River from March-July for the past three years along with minimum (2012) and maximum (2015) cumulative loads for the last 20 years. Data collected by Heidelberg University, National Center for Water Quality Research.

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The Lake Erie HAB Seasonal Forecast was low: The forecasted bloom severity was between 2.0-4.5, an underestimate. The forecast uses an ensemble of different models, each of which consider phosphorus loading into the lake during the spring and early summer (March - July). The large bioavailable phosphorus load in July 2021, the third highest since 2008, may have led to the larger than forecasted bloom. Previous years (2015 and 2017) with large July loads also had wet springs, leading to a large input of phosphorus in the spring, reducing the relative influence of the July load. In contrast, 2021 had a drier spring than average, suggesting the relative importance of July loads on the bloom. We will continue our assessment of the models in order to make improvements to the forecast and severity metrics.

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For more information visit: http://www.ncwqr.org/ or http://coastalscience.noaa.gov/research/habs/forecasting

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