



HABs AND CLIMATE CHANGE

Changes to our climate are already happening

If urgent climate action is not taken in the next decade, we are to expect irreversible changes to our environment. On September 22, 2019, the world's leading climate science organizations met for the United Nations Climate Action Summit to synthesize the [*United In Science*](#) report, laying out the latest climate science information and ambitious goals to tackle climate change. Here is a snapshot of what we know:

- 🌍 As of May 2020, global CO₂ concentrations have reached 417.07 parts per million (ppm). In at least the past 800,000 years, the global concentration of CO₂ has never been as high as it is today. For comparison, before the Industrial Revolution began in the mid-1700s, global CO₂ concentrations were around 280 ppm.
- 🌍 The average global temperature is steadily increasing and is already 1.1°C (2°F) above pre-industrial (1850-1900) times.
- 🌍 Sea levels and ocean temperatures are on the rise. The ocean takes in about 25% of annual anthropogenic CO₂ emissions, which then reacts with the seawater to also increase its acidity, further interfering with the aquatic ecosystem.
- 🌍 Weather patterns are more unpredictable. There are greater frequencies in intense heat waves, wildfires, and tropical cyclones.

The relationship between HABs and climate change

The United Nations' Intergovernmental Panel on Climate Change's (IPCC) Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) in 2019 was the first to explicitly correlate HABs and climate change (Gobler). The increased concentration of greenhouse gases in our atmosphere has led to astonishing rates of increase in land and ocean temperatures, rises in sea level, ocean acidification, and more unpredictable weather. It is also important to note that the altered patterns of precipitation may also intensify anthropogenic uses of nutrients. All such factors are likely to increase the frequency, and possibly the toxicity, of HABs. Over the past several decades, it has already been observed that HAB occurrences have increased (Gobler).

Cyanobacteria have an optimal growth rate at temperatures greater than 25°C (77°F). At this temperature, cyanobacteria can more effectively compete with other aquatic microorganisms, like eukaryotic algae. Because of the steady increase in temperature as a result of climate change, there will be a greater number of summer days that are above 25°C that is ideal for cyanobacterial growth that may then lead to a HAB (Paerl et al.).

In bodies of water that are high in nutrient concentration, algal blooms will show an increase in photosynthetic activity, and therefore, a higher demand for CO₂ that is necessary for photosynthesis. Therefore, surface level cyanobacteria have a greater advantage in absorbing the atmospheric CO₂ than subsurface phytoplankton. This again makes cyanobacteria more effective competitors than their counterparts. If human inputs of nutrients and atmospheric CO₂ are not controlled, cyanobacterial HAB occurrences will only increase (Paerl et al.).

Cyanobacterial populations are likely to thrive with increasing temperatures and more extreme climatic conditions as a result of climate change along with the input of nutrients into bodies of water and the increasing atmospheric CO₂. Therefore, the frequency of *harmful* cyanobacterial blooms will also likely increase. Still, more research is needed to deepen our understanding of how climate change will affect HABs and coastal communities, along with how to better predict and manage HABs (Paerl et al.).

HABs MONITORING PROGRAM

The Cayuga Lake HABs monitoring program has begun! This year, there are 87 trained HABs Harrier volunteers who monitor weekly for HABs along their designated monitoring shoreline zone. In doing so, the program is able to survey 48% of Cayuga Lakes' shoreline—a 1% increase in shoreline coverage from last year.



HABs Harrier volunteers can drop off iced water samples of suspected HABs at any time of day at the Community Science Institute's (CSI) lab. The drop-off location also provides new sampling kits containing an amber glass bottle, gloves, report forms, and other supplies.

ALL ABOUT HABs

What is a harmful algal bloom (HAB)? HABs occur when cyanobacteria, also called blue-green algae, grow rapidly in number under specific conditions such as high nutrient concentrations (specifically of phosphorus and nitrogen), warm temperatures, high sunlight intensity and calm water.

Why are HABs *harmful*? Certain taxa of cyanobacteria produce toxins, termed cyanotoxins, that are harmful to humans, other mammals, aquatic species, and birds through ingestion, inhalation, or skin contact.

What does a HAB look like? HABs are commonly described as looking like scattered green dots, spilled paint, or linear green streaks. It is recommended to avoid any floating scum or discolored water for risk that it is a HAB.

What do I do if I believe I've had contact with a HAB? The following symptoms may occur from contact with a HAB: nausea, vomiting, diarrhea, skin, eye or throat irritation, breathing difficulties, and allergic reactions. If you think you have had contact with a HAB and/or experience any of the symptoms listed above, rinse your skin immediately with clean water and seek medical attention.

Reporting a HAB. If you observe a suspicious HAB, *avoid it and report it!* Email habshotline@gmail.com with the location of the bloom, the date and time, and two pictures. If possible, include the GPS coordinates of its location using the Compass app or Google Maps on smartphones. Otherwise, an address or nearby landmark will do the job! You may also call CSI at (607) 257-6606.

Staying Informed. Before heading on the lake, you can view the interactive map regularly updated by CSI that reports all identified HABs on Cayuga Lake [here](#). The DEC provides a similar interactive map of current HABs across New York State that you can open [here](#). You may also call your local park office on the most up-to-date water quality information (see below).

[Taughannock Falls State Park](#)

(607) 387-6739

[Cayuga Lake State Park](#)

(315) 568-5163

[Long Point State Park](#)

(315) 364- 5637 or (315) 497-0130

[Lansing Myers Park](#)

(607) 533-7388 ext. 17

References

- Gobler, Christopher J. "Climate Change and Harmful Algal Blooms: Insights and Perspective." *Harmful Algae*, vol. 91, 2020, p. 101731., doi:10.1016/j.hal.2019.101731.
- Paerl, Hans W., et al. "Mitigating a Global Expansion of Toxic Cyanobacterial Blooms: Confounding Effects and Challenges Posed by Climate Change." *Marine and Freshwater Research*, vol. 71, no. 5, 2020, p. 579., doi:10.1071/mf18392.
- United Nations Climate Action Summit. *United in Science*. 2019.

Sofia Walzer, Cayuga Lake Watershed Network 2020 HABs Communications Intern
habsintern2020@gmail.com

The Cayuga Lake HABs Monitoring Program is a collaborative effort led by a local consortium of three nonprofits: the Community Science Institute (CSI), the Cayuga Lake Watershed Network (CLWN), and Discover Cayuga Lake (DCL), working in collaboration with the New York State Department of Environmental Conservation (NYSDEC) and the State University of New York Environmental School of Forestry (SUNY-ESF).

Cayuga Lake Watershed Network
programs@cayugalake.org
607-319-0475

Community Science Institute
info@communityscience.org
607-257-6606

Discover Cayuga Lake
(607) 327-5253