

Environmental observations, physico-chemical data, chlorophyll, total and dissolved nutrients, plankton taxonomic classification, and cell abundance from surveys of Lake Erie from November 2024 to March 2025

Website: <https://www.bco-dmo.org/dataset/1006222>

Data Type: Cruise Results

Version: 1

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Project

» [Lake Erie Center for Fresh Waters and Human Health](#) (Great Lakes Center)

Contributors	Affiliation	Role
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Abstract

This dataset includes winter survey data from Lake Erie collected on USCG Morro Bay, CCGS Griffon, CCGS Samuel Risley, and MV Vigilant from November 2024 to March 2025. The survey includes environmental observations, physico-chemical data, chlorophyll, total and dissolved nutrients, plankton taxonomic classification, and cell abundance. The Lake Erie Center for Fresh Waters and Human Health is a multi-institutional effort aimed at understanding the environmental factors and ongoing changes that influence the growth and toxicity of cyanobacterial harmful algal blooms (cHABs) in Lake Erie.

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Coverage

Location: Laurentian Great Lakes

Spatial Extent: N:42.57 E:-80.642 S:41.715 W:-82.667

Temporal Extent: 2024-11-02 - 2025-03-11

Methods & Sampling

The vessel came to a stop when the predetermined sampling station was reached, at a time decided on by the ship's command. The location and time of sampling were recorded, as well as the environmental conditions. The trained crew members of the vessel then used a YSI water quality sonde to collect data that were recorded. A Secchi disc with measurement indicators every 10 centimeters was then deployed, and recordings were taken on both the upcast and downcast. A Van Dorn water sampler was then used to collect water at a

depth of 1 meter. Water samples were then transferred to 1-liter (L) polyethylene storage bottles or 2 L plastic storage bottles, and stored in a dark place at 4 degrees Celsius until picked up by personnel on the same day. The samples were then transported in dark coolers containing ice packs to Bowling Green State University (BGSU) or the University of Windsor (GLIER). Samples were also collected from Mitchell's Bay (a land-based sampling location) using the same methods and observational conventions.

Sub-samples for chlorophyll a were taken in the laboratory using 0.45 micrometer (um) nylon and 20 um polycarbonate membranes and a vacuum filtration system. The filter was placed in a screw cap polyethylene centrifuge tube and stored in a dark freezer until extraction. The samples were extracted using 90% acetone and kept at -20 degrees Celsius for 24 hours, and chlorophyll was measured using a TD-700 fluorometer (Welschmeyer, 1994).

Total and dissolved nutrient samples were held in acid-washed 250 milliliter (mL) polyethylene bottles and stored in a dark freezer at -20 degrees Celsius until they were ready to be analyzed. Dissolved nutrient sub-samples were taken by filtering the agitated sampled water through 0.22 um filters. The frozen samples were then shipped on ice to the National Center for Water Quality Research at Heidelberg University (Tiffin, OH). Microscopy was performed on raw water samples that were preserved with 5% Lugol's iodine solution. These samples were stored at room temperature in the dark until shipped and analyzed by Aquatic Taxonomy Specialists (Malinta, OH).

Data Processing Description

The meteorological data was taken directly from readings using vessel instruments, marine forecasts, and expert observations. The physico-chemical data was obtained using a YSI 600QS multiparameter sonde, and nutrient concentrations were analyzed at the National Center for Water Quality Research at Heidelberg University. Fluorometric classification of phytoplankton was measured using a FluoroProbe (bbe Moldaenke GmbH, Schwentimental, Germany), and plankton taxonomic classification and cell enumeration was conducted by Aquatic Taxonomy Specialists (Malinta, OH). The extractive chlorophyll was read using a TD-700 Fluorometer (Turner Designs Inc., San Jose, CA), the sample concentrations were then calculated with the equation below, and the averages for each site were calculated from the triplicate samples.

$$\text{Chla} = ((\text{reading} \times \text{volume}_{\text{extracted}}) / \text{volume}_{\text{filtered}}) * \text{dilution factor}$$

BCO-DMO Curation Notes

This section documents curation actions performed by BCO-DMO and additional information relevant to understanding and reusing this dataset. It distinguishes changes made to the submitted (meta)data from unresolved issues and/or enhancements that improve future reuse and interoperability.

CURATION ACTIONS PERFORMED ON DATA

- Imported original file "winter_lake_erie_2025_metadata.csv" into the BCO-DMO data processing system.
- Treated "-" as a missing data value (missing data values are empty/blank in the final CSV file).
- Created new column ISO_DateTime_Local by combining date (format %m-%d-%Y) and time_edt (format %H:%M) columns into a datetime with output format %Y-%m-%dT%H:%M.
- Converted date column format from %m-%d-%Y to %Y-%m-%d, output as date type.
- Renamed columns to comply with BCO-DMO naming conventions.
- Saved the final file as "1006222_v1_winter_lake_erie_2024_to_2025.csv".

CURATION ACTIONS PERFORMED ON METADATA

- BCO-DMO's standard metadata entry and text formatting steps were performed.

ISSUES POTENTIALLY IMPACTING REUSE

- The time zone is listed as Eastern Daylight Time (EDT), but during the time span of the dataset, local time would have switched to Eastern Standard Time (EST). One might assume EDT was used throughout the dataset, but this has not been confirmed by the data submitter.

Related Publications

Welschmeyer, N. A. (1994). Fluorometric analysis of chlorophyll a in the presence of chlorophyll b and pheopigments. Limnology and Oceanography, 39(8), 1985–1992. doi:[10.4319/lo.1994.39.8.1985](https://doi.org/10.4319/lo.1994.39.8.1985)
Methods

Parameters

Parameter	Description	Units
station	Station identifier	unitless
lake	Lake sampled	unitless
date	Date of sample collection	unitless
time_edt	Time of sample collection; HH:MM format in Eastern Daylight time	unitless
ISO_DateTime_Local	Date and time of sample collection (EDT) in ISO 8601 format	unitless
latitude_dec_deg	Latitude of sample collection, South is negative	decimal degrees
longitude_dec_deg	Longitude of sample collection, West is negative	decimal degrees
lat_long	Latitude and longitude of sample site. Lat, long format	decimal degrees
sample_depth	Depth sample taken	meters
station_depth	Depth of the sample site	meters
air_temp	Air temperature	degrees Celsius
water_temp	Surface water temperature	degrees Celsius
snow_thickness	Depth of snow on the surface ice	inches
snow_cover_percent	Estimated area of sample site covered with snow	percent (%)

ice_thickness	Thickness of ice	inches
ice_cover_percent	Estimated area of sample site covered by ice	percent (%)
ice_narrative	Description of ice	unitless
wind_speed	Wind speed	knots
wind_direction	Wind direction in cardinal (compass) directions	unitless
barometer	Barometer reading	inches Hg
cloud_cover_percent	Estimated cloud cover	percent (%)
wave_height	Wave height	meters
ph	pH	unitless
dissolved_oxygen_percent	Dissolved oxygen of surface water	percent (%)
dissolved_oxygen	Dissolved mg of oxygen per litre of water	milligrams per liter (mg L-1)
secchi_down_up	Downcast and upcast readings; measure of water transparency	meters
ammonia	Dissolved nutrients: ammonia	milligrams per liter (mg L-1)
chloride	Dissolved nutrients: chloride	milligrams per liter (mg L-1)
sulfate	Dissolved nutrients: sulfate	milligrams per liter (mg L-1)
nitrite	Dissolved nutrients: nitrite	milligrams per liter (mg L-1)
nitrate	Dissolved nutrients: nitrate	milligrams per liter (mg L-1)
silica	Dissolved nutrients: silica	milligrams per liter (mg L-1)
soluble_reactive_phosphorus	Dissolved nutrients: soluble reactive phosphorus	milligrams per liter (mg L-1)

fluoride	Dissolved nutrients: fluoride	milligrams per liter (mg L-1)
total_phosphorus	Particulate nutrients: total phosphorus	milligrams per liter (mg L-1)
total_nitrogen	Particulate nutrients: total nitrogen	milligrams per liter (mg L-1)
conductivity	Molar conductivity of raw water	molar conductivity
chlorophyll_a_gt_0_45_um	Average extracted chlorophyll of cell fraction greater than 0.45 um	micrograms per liter (ug L-1)
chlorophyll_a_gt_20_um	Average extracted chlorophyll of cell fraction greater than 20 um	micrograms per liter (ug L-1)
amphora_spp	Cell abundance: Amphora spp	Cells per mL (cells ml-1)
achnanthidium_spp	Cell abundance: Achnanthidium spp	Cells per mL (cells ml-1)
asterionella_formosa	Cell abundance: Asterionella formosa	Cells per mL (cells ml-1)
aulacoseira_spp	Cell abundance: Aulacoseira spp	Cells per mL (cells ml-1)
diatom_centric	Cell abundance: Centric diatoms	Cells per mL (cells ml-1)
cocconeis_spp	Cell abundance: Cocconeis spp	Cells per mL (cells ml-1)
diatoma_spp	Cell abundance: Diatoma spp	Cells per mL (cells ml-1)
fragilaria_spp	Cell abundance: Fragilaria spp	Cells per mL (cells ml-1)
gomphonema_sp	Cell abundance: Gomphonema sp	Cells per mL (cells ml-1)
navicula_spp	Cell abundance: Navicula spp	Cells per mL (cells ml-1)
nitzschia_sp	Cell abundance: Nitzschia sp	Cells per mL (cells ml-1)
placoneis_spp	Cell abundance: Placoneis spp	Cells per mL (cells ml-1)
staurosira_spp	Cell abundance: Staurosira spp	Cells per mL (cells ml-1)

staurosirella_spp	Cell abundance: Staurosirella spp	Cells per mL (cells ml-1)
stephanodiscus_bieranus	Cell abundance: Stephanodiscus bieranus	Cells per mL (cells ml-1)
stephanodiscus_spp	Cell abundance: Stephanodiscus spp	Cells per mL (cells ml-1)
surirella_spp	Cell abundance: Surirella spp	Cells per mL (cells ml-1)
synedra_spp	Cell abundance: Synedra spp	Cells per mL (cells ml-1)
tabellaria_spp	Cell abundance: Tabellaria spp	Cells per mL (cells ml-1)
microflagellates	Cell abundance: Microflagellates	Cells per mL (cells ml-1)
cryptophyta	Cell abundance: Cryptophyta	Cells per mL (cells ml-1)
pyrrophyta	Cell abundance: Pyrrophyta	Cells per mL (cells ml-1)
chrysophyta	Cell abundance: Chrysophyta	Cells per mL (cells ml-1)
euglenophyta	Cell abundance: Euglenophyta	Cells per mL (cells ml-1)
ankistrodesmus_spp	Cell abundance: Ankistrodesmus spp	Cells per mL (cells ml-1)
schroederia_spp	Cell abundance: Schroederia spp	Cells per mL (cells ml-1)
scenedesmus_spp	Cell abundance: Scenedesmus spp	Cells per mL (cells ml-1)
tetraedron_spp	Cell abundance: Tetraedron spp	Cells per mL (cells ml-1)
closterium_acutum	Cell abundance: Closterium acutum	Cells per mL (cells ml-1)
coccoid_chlorophytes	Cell abundance: Coccoid chlorophytes	Cells per mL (cells ml-1)
coelastrum_spp	Cell abundance: Coelastrum spp	Cells per mL (cells ml-1)
dictyosphaerium_spp	Cell abundance: Dictyosphaerium spp	Cells per mL (cells ml-1)

eudorina_spp	Cell abundance: Eudorina spp	Cells per mL (cells ml-1)
monoraphidium_spp	Cell abundance: Monoraphidium spp	Cells per mL (cells ml-1)
oocystis_spp	Cell abundance: Oocystis spp	Cells per mL (cells ml-1)
oocystidium_spp	Cell abundance: Oocystidium spp	Cells per mL (cells ml-1)
phacotus_spp	Cell abundance: Phacotus spp	Cells per mL (cells ml-1)
pediastrum_spp	Cell abundance: Pediastrum spp	Cells per mL (cells ml-1)
selenastrum_spp	Cell abundance: Selenastrum spp	Cells per mL (cells ml-1)
spermatozopsis_spp	Cell abundance: Spermatozopsis spp	Cells per mL (cells ml-1)
picoplankton	Cell abundance: Picoplankton	Cells per mL (cells ml-1)
planktolynghya_spp	Cell abundance: Planktolynghya spp	Cells per mL (cells ml-1)
aphanocapsa_spp	Cell abundance: Aphanocapsa spp	Cells per mL (cells ml-1)
aphanothece_spp	Cell abundance: Aphanothece spp	Cells per mL (cells ml-1)
aphanizomenon_spp	Cell abundance: Aphanizomenon spp	Cells per mL (cells ml-1)
chroococcus_microscopicus	Cell abundance: Chroococcus microscopicus	Cells per mL (cells ml-1)
coccoid_cyanophytes	Cell abundance: Coccoid cyanophytes	Cells per mL (cells ml-1)
coelosphaerium_spp	Cell abundance: Coelosphaerium spp	Cells per mL (cells ml-1)
dolichospermum_spp	Cell abundance: Dolichospermum spp	Cells per mL (cells ml-1)
phormidium_spp	Cell abundance: Phormidium spp	Cells per mL (cells ml-1)
leptolynghia_spp	Cell abundance: Leptolynghia spp	Cells per mL (cells ml-1)

myxobaktron_spp	Cell abundance: Myxobaktron spp	Cells per mL (cells ml-1)
microcystis_spp	Cell abundance: Microcystis spp	Cells per mL (cells ml-1)
merismopedia_tenuissima	Cell abundance: Merismopedia tenuissima	Cells per mL (cells ml-1)
planktothrix_agardhii	Cell abundance: Planktothrix agardhii	Cells per mL (cells ml-1)
pseudoanabaena_spp	Cell abundance: Pseudoanabaena spp	Cells per mL (cells ml-1)
synechococcus_spp	Cell abundance: Synechococcus spp	Cells per mL (cells ml-1)
woronichiana_spp	Cell abundance: Woronichiana spp	Cells per mL (cells ml-1)

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Instruments

Dataset-specific Instrument Name	Sample bottles (Nalgene or equivalent), plastic wash bottles, polyethylene bottles
Generic Instrument Name	Bottle
Dataset-specific Description	Sample bottles, 1 or 2 L (Nalgene or equivalent), Plastic wash bottle, 500 mL: Water samples are then transferred to 1 L polyethylene storage bottles or 2 L plastic storage bottles, and stored in a dark place at 4 degrees C until picked up by personnel on the same day. Total and dissolved nutrient samples were held in acid-washed 250 mL polyethylene bottles, and stored in a dark freezer at -20 degrees C until ready to be analyzed.
Generic Instrument Description	A container, typically made of glass or plastic and with a narrow neck, used for storing drinks or other liquids.

Dataset-specific Instrument Name	FluoroProbe
Generic Instrument Name	Fluorometer
Dataset-specific Description	Fluorometric classification of phytoplankton was measured using a FluoroProbe (bbe Moldaenke GmbH, Schwentinental, Germany).
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	National Center for Water Quality Research at Heidelberg University
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Total and dissolved nutrient samples were analyzed at the National Center for Water Quality Research at Heidelberg University (Tiffin, OH).
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

Dataset-specific Instrument Name	Secchi Disc
Generic Instrument Name	Secchi Disc
Dataset-specific Description	A Secchi disc with measurement indicators every 10 centimeters was deployed and recordings were taken on both the upcast and downcast.
Generic Instrument Description	Typically, a 16 inch diameter white/black quadrant disc used to measure water optical clarity

Dataset-specific Instrument Name	TD-700 fluorometer
Generic Instrument Name	Turner Designs 700 Laboratory Fluorometer
Dataset-specific Description	The extractive chlorophyll was read using a TD-700 Fluorometer (Turner Designs Inc., San Jose, CA), the sample concentrations were then calculated with the equation below, and the averages for each site were calculated from the triplicate samples.
Generic Instrument Description	The TD-700 Laboratory Fluorometer is a benchtop fluorometer designed to detect fluorescence over the UV to red range. The instrument can measure concentrations of a variety of compounds, including chlorophyll-a and fluorescent dyes, and is thus suitable for a range of applications, including chlorophyll, water quality monitoring and fluorescent tracer studies. Data can be output as concentrations or raw fluorescence measurements.

Dataset-specific Instrument Name	Vacuum manifold system
Generic Instrument Name	vacuum manifold
Dataset-specific Description	Vacuum manifold system to accommodate 3 filter funnels
Generic Instrument Description	A device that is used for the vacuum-driven processing of multiwell strips or plates, or spin columns.

Dataset-specific Instrument Name	2 L Van Dorn water sampler
Generic Instrument Name	Van Dorn water sampler
Dataset-specific Description	A Van Dorn water sampler was used to collect water at a depth of 1 meter.
Generic Instrument Description	A free-flushing water sample bottle comprising a cylinder (polycarbonate, acrylic or PVC) with a stopper at each end. The bottle is closed by means of a messenger from the surface releasing the tension on a latex band and thus pulling the two stoppers firmly into place. A thermometer can be mounted inside the bottle. One or more bottles can be lowered on a line to allow sampling at a single or multiple depth levels. Van Dorn samplers are suitable for physical (temperature), chemical and biological sampling in shallow to very deep water. Bottles are typically lowered vertically through the water column although a horizontal version is available for sampling near the seabed or at thermoclines or chemoclines. Because of the lack of metal parts the bottles are suitable for trace metal sampling, although the blue polyurethane seal used in the Alpha version may leach mercury. The Beta version uses white ASA plastic seals that do not leach mercury but are less durable.

Dataset-specific Instrument Name	YSI 600QS multiparameter sonde
Generic Instrument Name	YSI Sonde 6-Series
Dataset-specific Description	The physico-chemical data was obtained using a YSI 600QS multiparameter sonde, and nutrient concentrations were analyzed at the National Center for Water Quality Research at Heidelberg University.
Generic Instrument Description	YSI 6-Series water quality sondes and sensors are instruments for environmental monitoring and long-term deployments. YSI datasondes accept multiple water quality sensors (i.e., they are multiparameter sondes). Sondes can measure temperature, conductivity, dissolved oxygen, depth, turbidity, and other water quality parameters. The 6-Series includes several models. More from YSI.

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Project Information

Lake Erie Center for Fresh Waters and Human Health (Great Lakes Center)

Website: <https://www.bgsu.edu/great-lakes-center.html>

Coverage: Laurentian Great Lakes

NSF Award Abstract:

The Lake Erie Center for Fresh Waters and Human Health is a five-year, multi-institutional effort aimed at understanding the environmental factors and ongoing changes that influence the growth and toxicity of cyanobacterial harmful algal blooms (cHABs) in Lake Erie. The Center will support three research projects. Specifically these projects address the following aims: first, how environmental cues promote or constrain the proliferation of cHAB species in mixed populations; second, how environmental cues influence toxin production by cHAB species; third, how other member of the microbial assemblage influence cHAB growth and toxicity. The Center will provide a Community Engagement Core to lead outreach activities that will inform the general public on the effects of cHABs by efforts that include: (1) a community engaged scholarship training for scientists associated with the Center, (2) community-engaged scholarship training for practitioners or community members associated with the Center, and (3) a stakeholder needs assessment for Great Lakes and environmental health literacy to inform general outreach information needs. A citizen science engagement with charter boat captains will further develop a near real-time database on cHAB severity in Lake Erie, and the Facilities Core will provide metadata that not only serve the three stated research projects, but also yield a database available to all Great Lakes scientists. The outcomes are to involve community stakeholders and researchers in the Great Lakes on issues regarding human health, climate change and awareness of threats to our fresh water resources.

The Center is jointly supported by NSF and by the National Institute for Environmental Health Sciences (NIEHS).

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1840715

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