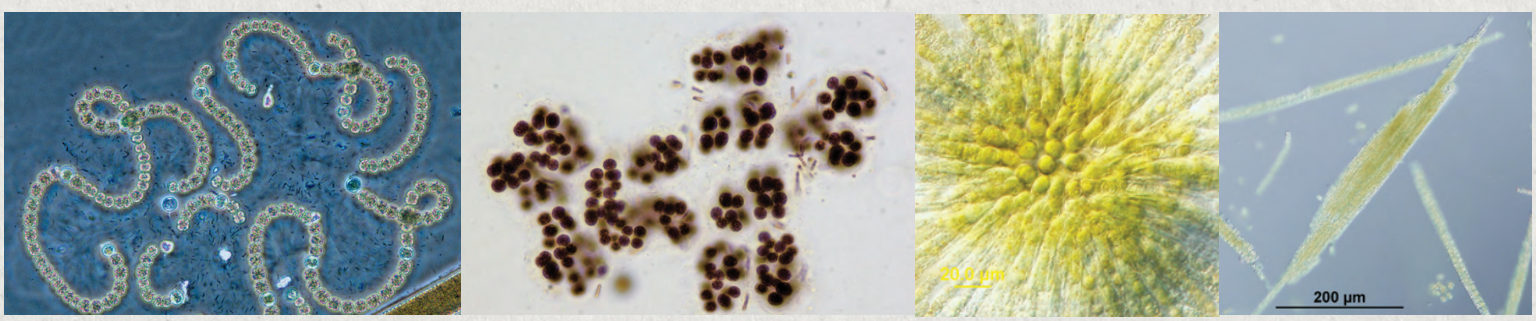
Lake Wallenpaupack Community Science Newsletter

Scientists for Community, Community for Science



Images from the "Field and Laboratory Guide to Freshwater Cyanobacteria Harmful Algal Blooms for Native American and Alaska Native Communities" by the US Department of Interior and USGS. From left to right there are images of the following cyanobacteria: *Dolichospermum circinale* (photographed by Ann St. Amand), *Microcystis viridis* (photographed by Amand), Gloeotrichia echinulata (photographed by Barry H. Rosen), and Aphanizomenon flos-aquae (photographed by Rosen) (6).

Algae, Algae, Algae...

Algae are a diverse group of photosynthetic organisms. Like plants, algae require carbon dioxide and light to make organic molecules like glucose and produce oxygen as a by-product. Algae are naturally occurring and essential members of aquatic ecosystems, contributing to system stability through regulation of nutrient cycles and roles as a food source for many lower trophic organisms (4).

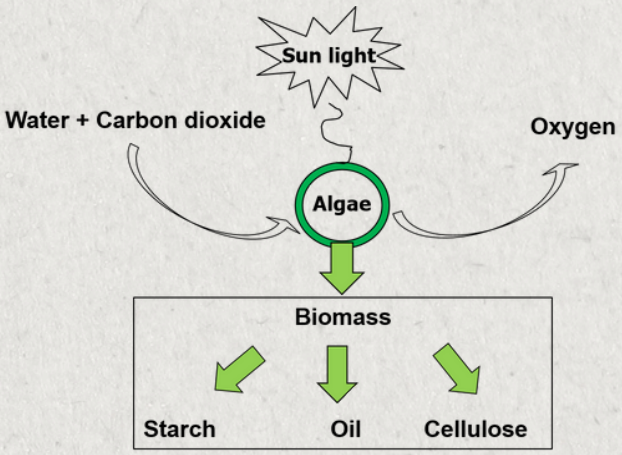


Figure 1. Photosynthesis of algae and its products. Algae utilize sunlight and require water and carbon dioxide to produce oxygen and organic molecules (2).

Algae, Phytoplankton, and Cyanobacteria... all the same?

Algae is a general term given to a wide array of organisms that produce oxygen through photosynthesis. Though they share this quality with plants, algae are not considered true plants as they lack plant structures (like leaves, roots, and/or stems). Phytoplankton are algae found in the water column, a characteristic which gives them their Greek name: "phyto", meaning "plant" and "plankton", meaning "made to wander or drift" (3). Phytoplankton are typically single-celled protists, bacteria, or plants capable of moving within a water column. Most phytoplankton that are bacteria are cyanobacteria. Cyanobacteria are commonly referred to as "blue-green algae"; but more recent findings have more appropriately classified these "algae" as bacteria! **In short, cyanobacteria is a bacteria that is considered a phytoplankton; all phytoplankton are considered algae, but not all algae are phytoplankton!**

How Does Community Science Data Collection Account for Algae?

How do we Quantify Algae in our Community Science Samples?

To quantify algae, a specific amount of the biweekly water samples collected are individually vacuumed through a glass fiber filter to trap algae (see images below). The filter is then agitated and steeped in an acetone solution to release chlorophyll-a (a primary pigment needed for photosynthesis) from algal cells. This steeped solution is later read on a fluorometer and the chlorophyll-a concentration is used to estimate algal biomass. PLEON utilizes an adapted protocol from Kristin Strock, based off of EPA protocol 445.0 (1).

Figure 2: Filter apparatus and vacuum pump setup. Our filter apparatus can process three samples with one vacuum pump, making processing Wallenpaupack Monitoring samples faster!

How Can Sampling Time Impact Results?

Algal blooms and HABs are extremely dynamic and may vary spatially and temporally; they can be impacted by nutrient and watershed inflows, as well as time of day and wind (5). Some cyanobacteria, are buoyant and can adjust their depth in the water column (5,6). They tend to rise to the surface in early morning and sink to deeper water in early afternoon (5).

Figure 3: Before and after filtering water samples for chlorophyll-a. Glass fiber filters are typically white and snowy in appearance (left); following filtration, the filter has "trapped" the sample, typically resulting in a yellowish or green color.

Sources Cited:

(1) Arar, E. J. & Collins, G. B. Method 445.0 In Vitro Determination of Chlorophyll a and Pheophytin in Marine and Freshwater Algae by Fluorescence. U.S. Environmental Protection Agency. 1997. https://cfpub.epa.gov/si/si_public_record_report.cfmLab=NERL&dirEntryId=309417

(2) Dunford, N. Algal Biomass Production. Oklahoma State University Extension. 2015. https://extension.okstate.edu/fact-sheets/algal-biomass-production.html

(3) Lindsey, R. &Scott, M. What are Phytoplankton? NASA Earth Observatory. 2010. https://earthobservatory.nasa.gov/features/Phytoplankton

(4) Lobus, N.V. Biogeochemical Role of Algae in Aquatic Ecosystems: Basic Research and Applied Biotechnology. Journal of Marine Science and Engineering. 2022, 10, 1846. https://doi.org/10.3390/jmse10121846

(5) Queensland Government. Sampling freshwater and marine microalgae and harmful algal blooms. Environmental Protection (Water) Policy - 2009. 2018. https://environment.des.qld.gov.au/__data/assets/pdf_file/0030/90777/biological-assessment-sampling-freshwater-and-marine-microalgae-and-harmful-algal-blooms.pdf

(6) Rosen, B.H., and St. Amand, Ann, Field and laboratory guide to freshwater cyanobacteria harmful algal blooms for Native American and Alaska Native Communities. U.S. Geological Survey. 2015, 1164. http://dx.doi.org/10.3133/ofr20151164

Want to join the Wallenpaupack Community Led Water Quality Monitoring Program?

Email pleon@lacawac.org

Page created by: Alexandra Bros and Regan Thompson