

## **5.2 CyanoScope (Tier 2)**

This “second tier” of the cyanomonitoring program is established in order *to identify and determine the timing and spatial distribution of cyanobacteria genera*, assisting in the mapping and identification of potential toxin producing waterbodies as well as providing an educational component.

Samples are collected on the lake, from the shoreline, or both utilizing a 50 micron plankton net, concentrated utilizing a specialized tool, and then observed and recorded utilizing a microscope and digital image capture software. Monitoring “kits” have been developed and put together to provide consistency and quality assurance while sampling (*Figure 8*). Samples can be collected at any time, at any frequency, and at as many locations as desired, as the main goal is to determine the genera of cyanobacteria that may be residing in the waterbody.



*Figure 8: Cyanobacteria monitoring kit & components*

### **5.2a Procedure for on the lake collection**

Position your watercraft at your desired location for sample collection and record your position. This can be accomplished using several methods. If you have a GPS unit, you can simply record your latitude and longitude in a field notebook. Or, alternatively and less susceptible to transcription error, you can save a waypoint on your GPS unit. It is also possible to record your GPS location in the metadata of a photograph taken from your location with your smartphone. If these GPS-based methods are not available or forgotten, you can record your location later utilizing the mapping locator in the cyanoScope project in “add an observation” page. Sampling for cyanoScope can be done at any lake, pond, reservoir, or other water body to which you have access. Sampling can also be conducted at any frequency; even a one-time visit to a site is acceptable.

Once your location has been recorded, take out your plankton net and make sure the tube at the bottom of your net is pinched closed with the attached clip. Vertically lower your 53micron plankton net to your desired depth, ensuring that it does not come in contact with the bottom. The net should then be slowly retrieved at a rate of approximately one foot per second until your reach the surface. A slow retrieval is important because the mouth of the net can form a pressure wave that will actually displace organisms and plankton, preventing them from being captured in the net sample. Too slow of a retrieval and you won’t be pushing the water through to capture your material. Once at the surface, vertically dip the lower two thirds of the net a couple times in the water to help wash material off the interior walls of the net and down into the lower plastic end of the net. You may also splash lake water against the outside of your net to help wash material down. Your “net sample” can now be transferred to the 500mL or larger opaque brown plastic bottle that came with your kit.

If you are collecting a sample from the shoreline, the plankton net may be tossed out away from the shoreline and then retrieved in a horizontal fashion back to shore. Care should be taken not to contact the bottom and fill the net with debris, yet retrieve at a slow enough rate not to push plankton away from the net opening. If there is a current bloom taking place along the shoreline, samples may also be collected utilizing a container. Processing the samples for slide mounting is the same for all approaches. **Note:** One should wear gloves as a safety precaution when handling any samples suspected of containing cyanobacteria.

Once back on shore/office, gently mix your sample and transfer from the brown bottle into your ZAPPR up to the thread marks (make certain the tube on the bottom of your ZAPPR is closed first!). This should leave you approximately one quarter of an inch of air between the top of the cap and the surface of your sample. Place the cap snugly on the ZAPPR and place in an upright position, leaving it undisturbed for approximately thirty minutes. During this time, any bloom forming cyanobacteria, through buoyancy regulation and respiration, will move towards the surface of your sample in the darkened environment. Zooplankton, being attracted to the light, will migrate to the clear bottom portion of the ZAPPR resulting in a nicely separated sample (Figure 9). After the thirty minute mark, GENTLY unscrew the cap of the ZAPPR. Any



disturbance, even a slight tap, will cause the cyanobacteria to be redistributed in the water column away from the surface and you will have to wait several more minutes for them to float up to the surface again. Once the cap is off, use one of the small pipettes supplied with your kit to siphon off a small amount of sample from the surface of your sample. The cyanobacteria have a tendency to adhere to the sides of the tube, so utilize a sweeping motion with your pipette along the edge and at the surface to collect a good sample. Once collected, place a couple drops of sample on a clean glass slide, place a glass or plastic coverslip over the sample, and you are ready to view organisms under the microscope.<sup>9</sup>

### **5.2b Microscope Imaging Software**

Any type of microscope software that allows taking of digital images can be used for the program along with a microscope of 40x magnification or greater. Digital software is included in

the cyanoScope kit however, and is quite simple to install and use. As long as the images are saved in an image format such as .jpg/.bmp/.tff, they will upload into the cyanoScope project.

### **5.2c Adding Observations to iNaturalist**

CyanoScope is a project on iNaturalist.org. While cyanoScope is only designed to capture occurrence image data for cyanobacteria, iNaturalist allows users to submit observational data about all global biodiversity. Before you begin uploading cyanobacteria observations to cyanoScope, you must first have an iNaturalist account which you can set up within the website. Once set up, then you can join the cyanoScope project and start submitting your observations.

To submit a cyanobacteria observation to the cyanoScope project, navigate to <http://www.inaturalist.org/projects/cyanoscope> and click on the “Add Observations” button. The following instructions will guide you through adding a single observation. *A single observation is a microscope photo of a single genus from one net sample.* For example, photos of even the same genus from different sampling locations (even on the same water body) would be two different observations. Or conversely, photos of two different genera from the same net sample would be two observations. If you would like to submit multiple observations more efficiently, follow the “Batch” link at the top right of the cyanoScope observation page and follow the step by step procedure there.



Once you've joined the cyanoScope project on iNaturalist, you are able to submit observations. Simply click the “Add Observations” banner on the project’s homepage

**Note:** Due to the difficulty of distinguishing between some cyanobacteria species, genus is the lowest taxonomic rank that will be used in the cyanoScope project.

Adding location information to observations is critical for this project. This can be accomplished using several methods:

1. **Use photo metadata:** If you have a GPS-enabled smartphone, the location information will be captured in your photos' metadata. iNaturalist can directly read the location information if you check the box next to "Syn. obs. w/ photo metadata?" As a word of caution, ***be aware of where the photo was taken***. The location should be where the sampling was conducted and not where the microscope photo was taken. A photo of the sampling site can be used to capture the location information, but be sure to validate location information.

The screenshot shows the 'Add an observation to cyanoScope' interface. At the top, a yellow banner says 'Signed in successfully.' Below it, there are navigation links: 'Add: Batch · From list · Import · From photos'. The form is divided into several sections: 'What did you see?' with a search icon and a text input; 'Where were you?' with a text input for the place name, a map, and fields for latitude, longitude, altitude, and source; 'Add media' with 'Add photos' and 'Add sounds' buttons; and a 'Select one or more photos' section with a 'Choose Files' button and a 'Sync obs. w/ photo metadata?' checkbox. A red arrow points to the 'Sync obs. w/ photo metadata?' checkbox. The map shows a satellite view of a coastal area.

2. **Use the map interface to either navigate with a cursor or type in location name:** If you type in the name of your sampling location, be sure it is the correct location. Lake and ponds names are generally very common (i.e. there are several waterbodies named Silver Lake in New Hampshire).
3. **Type in GPS coordinates:** It is possible to directly type in your site's latitude and longitude. The map will navigate to the location, allowing you to double check that you have entered the correct coordinates. It is important to have at least four decimal places for position fixes to ensure reasonable location accuracy.

Once you have entered the spatial information, you will need to complete the remaining text boxes for the observation. Note that you do not need to identify the cyanobacteria in your observation. If you do not know the genera of observations, check the "ID Please?" box.

Signed in successfully.

Add an observation to cyanoScope [Add](#) [Batch](#) [From list](#) [Import](#) [From photos](#)

What did you see?  ID Please?  Where were you?

Name of the place you made the observation

Lat: Lon: [Edit](#)  
Acc (m): Src:

Was it captive / cultivated?

When did you see it?

(GMT-05:00) Eastern Time (US & Canada)  
e.g. "2016-07-28 13:19:42", yesterday at 4pm

Description

Map Satellite

Add media

Select one or more photos

No file chosen

Sync obs. w/ photo metadata? [clear](#)

After all the information has been added, you need to upload your microscope photos. Click the “Choose Files” button in the “Add media” box and navigate to the photo location on your computer. You can upload multiple pictures for a single observation, if you feel that this might aid with identification.

Signed in successfully.

Add an observation to cyanoScope [Add](#) [Batch](#) [From list](#) [Import](#) [From photos](#)

What did you see?  ID Please?  Where were you?

Name of the place you made the observation

Lat: Lon: [Edit](#)  
Acc (m): Src:

Was it captive / cultivated?

When did you see it?

(GMT-05:00) Eastern Time (US & Canada)  
e.g. "2016-07-28 13:19:42", yesterday at 4pm

Description

Map Satellite

Add media

Select one or more photos

No file chosen

Sync obs. w/ photo metadata? [clear](#)

Finally, click the “Save Observation” button at the bottom of the “Add Observation” page. After you submit an observation, several things will happen. Your observation will be shared with the entire cyanoScope community on iNaturalist. This will allow other users to propose an identification and to have conversations and ask questions about your observations. At this point the observation will be added to the cyanoScope project and will be included on the map. A preselected project curator/s will eventually verify an identification, the observation will be elevated to research grade and the ID will then be locked. Nonetheless, the conversations about the observation can continue.