Enlisting Public Help with Cyanobacteria Monitoring

-- Or –

Do you really need a phycologist to identify green slime?

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Training Volunteers

PWSWCD needed a way for their cadre of Citizen Scientist water monitoring volunteers to check for cyanobacteria

Options

- **Satellites such as Sentinel-3: MERIS resolution is 300x300 meters, so waters less than about 1 km across are too small.**
- **Infrequent orbital passes, useless under clouds**
- **Electric multirotor UAS with multispectral cameras can provide similar results, but require trained and licensed operators, have airspace restrictions, and are expensive**
- **Pond on the previous page is at a hospital with a helipad, a big complication.**
- **Or use the Lake Champlain Committee approach: trained volunteers with eyeballs, a jar, and a stick.**

Lake Champlain Committee

300+ volunteers

3 hours of training on-line

- No lab tests, no microscopy
- Very fast, inexpensive
- Local authorities have learned to trust the identifications
- No visible signs / light bloom / medium bloom / heavy bloom
- Surface blooms only, not benthic
- Distinguish from harmless green stuff
- Authorities may follow up with testing, but will take action on simple visual evidence of cyanobacteria

On-Line Reporting

LCC maintains a reporting site for convenient reporting of observations.

Open to public use but mainly for trained volunteers.

Results monitored and forwarded by LCC but can also be used by local water/health authorities.

MAKE IT EASY!

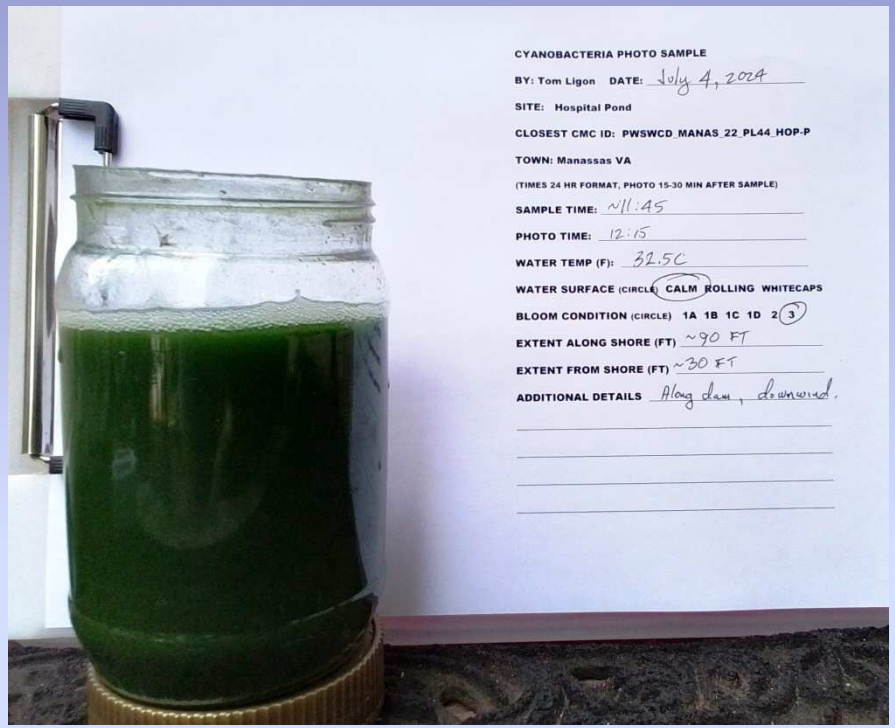
PWSWCD Program

- Already have volunteers doing benthic macroinvertebrates and chemical monitoring with YSI probes
- Many volunteers are Master Naturalists with other training
- Initially poached LCC training (with permission)
- But LCC program calls for weekly monitoring, daily if CB is present
- Our macroinvertebrate monitoring is for streams, and quarterly
- Our chemical monitoring includes stormwater ponds, is monthly

Method

- **Photograph close to show surface condition**
- **Photograph wide to show extent**

Method



- **Capture a sample in a jar, let settle 15 minutes**
- **Photograph with a form with needed data**
- **Some samples more obvious than others**

Training

- Give examples of cyanobacteria blooms
- Light, Medium, Heavy
- If light, medium, are small globs present in jar sample?
- Spilled green paint / pea soup appearance?
- Areas of white or turquoise/blue color? (breakdown products)
- Water temperature if possible
- Record and report findings per local agreements
- NEGATIVE RESULTS SHOULD BE REPORTED TOO!
- LCC training materials: https://www.lakechamplaincommittee.org/lcc-at-work/cyanobacteria-in-lake

More Training

- **More often you see “Not Cyanobacteria”**
- **Filamentous Green Algae (FGA) (stick test)**
- **Duckweed (from a distance looks like CB, but close picture should show mini- lily pads)**
- **Other water plants**
- **Pollen**
- **Iron Bacteria**
- **Surface films?**
- **NEGATIVE RESULTS SHOULD BE REPORTED TOO!**
- **LCC training materials: https://www.lakechamplaincommittee.org/lcc-at-work/cyanobacteria-in-lake**

Highly Scientific Equipment

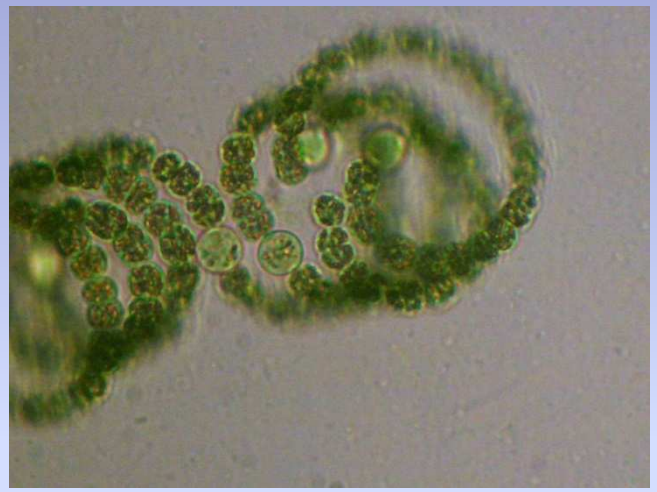
- **FGA Detection Device (aka stick)**
- **Jar**
- **Jar holder or waterproof gloves**
- **Maybe an ice chest**
- **Got a good thermometer?**
- **https://www.lakechamplaincommittee.org/lcc-at-work/cyanobacteria-in-lake**

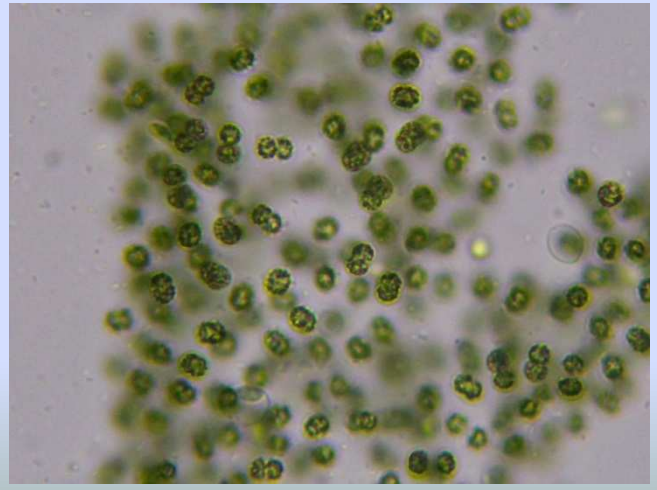
Training Lite

For close neighbors:

- **Quick lesson in CB vs Not CB**
- **Provide web resources**
- **Take close and wide picture**
- **Report positive observations**
- **Weekly in CB season**
- **Daily if CB present**
- **Now including this in our Merrimac Farm VMN basic training**

Extra Credit



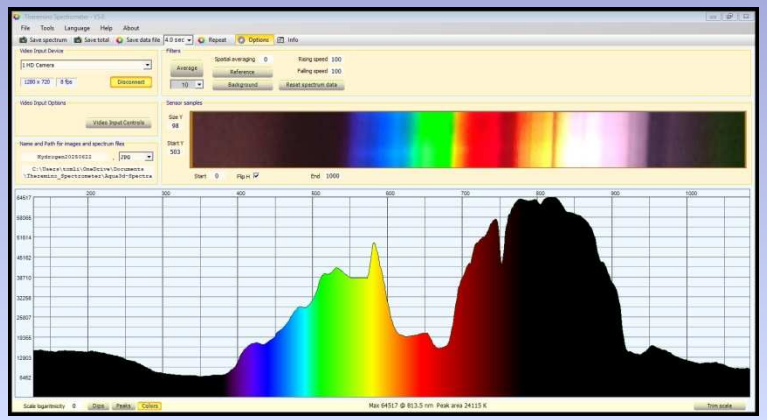


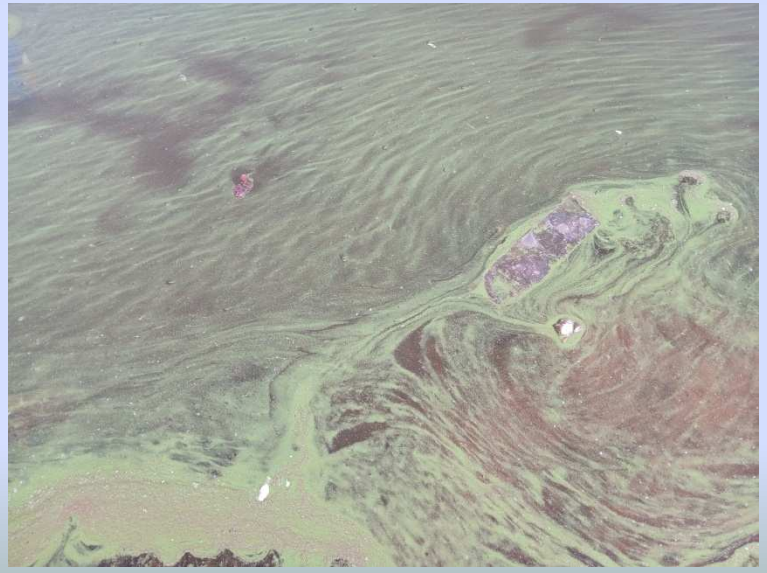
Got microscope?

- **Add camera ($100-200?)**
- **Globule onto slide, coverslip**
- **Take shot**
- **Local expert or lab available?**
- **Or iNaturalist Cyanoscope project**
- **https://www.inaturalist.org/projects/cyanoscope**
- **Or samples on ice to local lab**

- **Shot with a Celestron 5MP Digital Microscope Imager**
- **AO Spencer Binocular, 45x objective**

For the totally nuts …

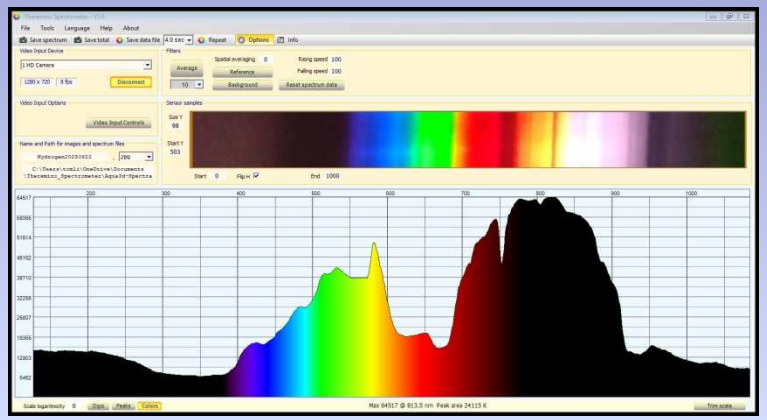


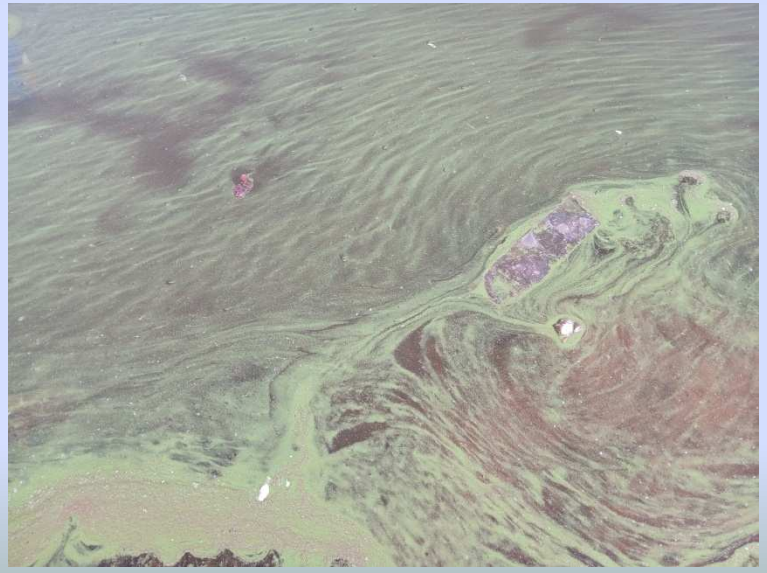


Got Spectrometer?

- **Cheap now ($100-200?)**
- **Webcam, grating, slit, box**
- **Calibrate with fluorescent lamp**
- **Free software converts rainbows to line plots**
- **Potentially better than a multi-spectral camera**
- **Spreadsheet or Octave to process to the bands necessary to spot phycocyanin**
- **Work in progress …**

Does a spectrometer really help?





- Eyeball ID probably better
- But positive ID of phycocyanin boosts ID confidence
- Convince the doubters?
- Not worthwhile for $20k instrument
- But for <$200? Intriguing

Thanks for listening

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Spectrometer: Aqua3d Lab 360-1000 nm
Spectrometer software:
https://aqua3dlab.com/downloads
Other comparable low-cost spectrometers available
Not an endorsement

All photos by Tom Ligon