

Sajdah Al-eid

EEES 1140: Environmental Problems Lab –Harmful Algal Blooms – Spring 2016

HARMFUL ALGAL BLOOMS: ECOSYSTEM EFFECTS, WATER SAFETY, AND WATER FILTERS

I. INTRODUCTION

Before Coming to Class: Read the online brochure from Ohio EPA concerning Harmful Algal Blooms (HABs) at: <http://epa.ohio.gov/Portals/28/documents/HABs/Publications/HABBrochure.pdf>.

In Class Video: During class, you will watch the video from The National Center for Water Quality Research at Heidelberg University in Tiffin, Ohio: <http://lakeeriealgae.com/>.

For additional background: Refer to the PowerPoint slides presented in class and available on the class blackboard website.

II. LAB EXERCISES

General Instructions:

Participate in activities demonstrating how human-caused algal blooms can change aquatic ecosystems, by (1) observing how algal blooms alter the physical environment, (2) exploring the efficiency of water filters to remove algae and their chemicals from drinking water, and (3) thinking about what factors cause algal blooms in Lake Erie.

Part I: Measuring how algal blooms affect the aquatic ecosystem:

Supplies

- | | | |
|---------------------------|-----------------------|--------------------------|
| 1. Flash Light | 3. EC/pH Meter | 6. Light Meter |
| 2. Water Sample w/ Algae | 4. DI Water Rinse Cup | 7. 2 Ammonia Strips (TA) |
| 3. Water Sample w/o Algae | 5. Thermometer | |

Procedure:

☐ Light color and its penetration through the water column:

1. Shine a white light through a sample of water with algae onto a sheet of white paper.
2. Record color and intensity of emerging light in the data table.
3. Repeat the steps above for a water sample without algae.

☐ Conductivity and pH:

1. Use pH paper or hand-held pH/conductivity meter to measure pH in a water sample with algae.
2. Record pH (after 20 seconds if using meter).
3. Rinse meter with DI water.
4. Use pH paper or hand-held pH/conductivity meter to measure EC in a water sample with algae.
5. Record EC (after 20 seconds if using meter).
6. Rinse meter with DI water.
7. Repeat the above steps for a water sample without algae.

□ Temperature:

1. Use a thermometer to measure water temperature of the illuminated demonstration tanks with and without algae.
2. Record the temperature of each tank in °C.

□ Nutrient concentration demonstration: Ammonia:

1. Your TA will dip one nutrient strip into each water sample.
2. Record the concentration of ammonia in your data table.

Part II: How algae can affect the taste or safety of water, even when algal cells are removed:

Supplies

1. Brita Filter
2. Food Coloring ("Microcystin")
3. Algae
4. Peppermint Oil ("taste")

Procedure:

1. Filter algal-containing water through Brita filters.
2. Record the ability of each filter type to remove intact algae from the water.
 - a. *Indicated by green pigment retained by the filter or less green in the flow-thru.*
3. Record the ability of each filter to remove "algal taste" from the water, mimicked with lemon oil.
 - a. *Already in the algae solution.*
 - b. **DO NOT CONSUME.** *Smell the solution before and after filtration.*
4. Record the ability of each filter to remove the algal toxin, microcystin, mimicked with blue food coloring.
 - a. *Already in the algae solution.*
 - b. *Observe the color before and after filtration.*
5. Once everyone is done, together as a class we will watch this video about water filtration, then in your groups discuss the related questions

Part III: How the land and water connect to create algal blooms:

1. Look at a Satellite picture Lake Erie algal blooms projected by your TA. Then do the following discussion exercise.
 - a. Picture link:
http://eoimages.gsfc.nasa.gov/images/imagerecords/86000/86327/erie_oli_2015209_lrg.jpg

Worksheet Exercise: Interpretation

NAME Sajdah Aleid DATE _____

Part I: Ecosystem Effects:

Data table (1 point):

	Light Color:	Light Intensity:	pH:	EC:	NH ₄	Temp. (°C):
No Algae Present:	white	no Bright	8.65	.11	.25	22.2
Algae Present:	yellow green	cloudy	6.5	8.2	6	23.8

What effects did the presence of algae have on each of the parameters you tested (light, pH, EC, and temperature)? (3 points)

How does this effect an aquatic ecosystem? (2 points)

Part II: Water Safety:

Data table (1 point):

	Algae Removal:	"Microcystin" Removal:	"Taste" Removal:
Brita Filter:	little to none	little to none	No Removal

Which filter was able to remove the algae? (1 point) Brita / none

Which filter was able to remove the "microcystin" or the "taste"? (1 point) Brita / none

How does the municipal water supply water filtration system differ from the britta filter (1 point)?

How much algal blooms effect the cost of municipal water filtration in Toledo? Who ends up paying that extra cost (2 points)?

If we did not properly filter our water, what would some consequences be (1 point)?

Part III: Cause of algal blooms:

What do you notice about the land surrounding Lake Erie (1 point)?

How do you think this landscape influences algal blooms in the lake (2 points)?

Part IV: Reflection:

How are you adding nutrients to the Lake Erie watershed? (2 points)

Think about how nutrients enter the lake.

How can you reduce the amount of nutrients you add to the Lake Erie watershed? (2 points)