

Periphyton Lab

Teacher's Guide

Subject: Integrated Science (Life; Earth-Space; Physical)

Topic(s): Algae, Microscopy, Photosynthesis

Summary:

The periphyton study will familiarize students with the macro and micro algae common to springs and introduce them to the factors that influence algal growth. Students will observe and measure macro algae at locations in Alligator Lake. Students will then collect samples of the common varieties and will examine and compare the abundance and variety of algae by observing the slides under a microscope.

After completing the field lab, students will be able to:

Objective(s):

1. Classify algae as Protists
2. Examine macro-micro algae on surfaces (periphyton) & free floating (plankton)
3. Explain the benefits and hazards of algae (O₂ and HABs)

Ecosystem(s): Rivers/Springs/Lakes

Equipment:

- Protective vinyl gloves
- 3 x buckets or trays
- Data sheet & clipboard
- Magnifying lenses
- 3 x Microscopes w/ pupil cam and laptop
- Dip nets or rakes
- 3 x Eye droppers
- 1 x Rinse bucket
- Algae Reference Chart
- Waterproof Marker
- Slides and Cover slips
- Small ruler (mm)
- Boots or hip waders

Background:

- **Vocabulary:** periphyton, plankton, algae, diatoms; substrate, free floating, benthic
- **Reference Material:** DEP Algal Biology: <http://www.dep.state.fl.us/labs/biology/algae.htm>; Power Point slide presentation by Jan Stevenson, <http://aquat1.ifas.ufl.edu/guide/periph.html>; UF/IFAS Algae Website: <http://plants.ifas.ufl.edu/guide/2algae.html>; EPA
- **Equipment Training:** Use of the microscope, pupil cam software, slide preparation

Procedure (Engage; Explore; Explain)

1. Ask students where they think algae fits into an ecosystem. Are there good and bad algae? When does a good alga go 'bad?' Have students complete the hypothesis and rationale on their data sheets.
2. Divide students into three teams. Each team will collect an algal samples, from a different location: 1) benthic or submerged vegetation, 2) floating mats, and 3) water column. Students will record macroscopic observations in the field and take samples in buckets to the tables with microscopes and digital pupil cams. Each team will prepare a slide from their sample.
3. Using microscopes equipped with digital cameras, the teams will observe, draw and count the different types of algae using the algae reference charts. Students do not have to identify the algae, it is more important that they determine the number of different types observed. Students will draw the sample on their data sheet, and determine the algal richness (number of different types of algae observed) for each sample slide.
4. At least one pupil cam and laptop will be available to record and label particularly clear or diverse algae samples.
5. After observing all three samples, students will complete the student assessment/discussion questions.

Sunshine State Standards:

Science: SC.A.1.3.1, 3; SC.C.1.3.1; SC.D.1.3.1,3,5; SC.D.2.3.2; SC.G.1.3.4; SC.G.2.3.2,3,4; SC.H.1.3.2,4,6,7; SC.H.2.3.1; SC.H.2.3.7; **Language Arts:** LA.A.1.3.3; LA.C.1.3.1, 4 **Mathematics:** MA.A.1.3.1, 4; MA.B.4.3.1; MA.E.3.3.1 **Social Studies:** SS.A.6.3.2; SS.B.2.3.6, 9 **Climate Literacy:** 1-c,e,f; 5-a; 6-b,c **Ocean Literacy:** 2-c; 5-f; 6-e

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Student Data Sheet

General Information

Name:		Date:	
Teacher:		Time:	

Student Hypothesis and Rationale

If algae are 'plantlike protists,' then we would expect to find more types of algae near the (*choose one*: top, middle, bottom) of the water column because... _____

Field Observations/Measurements/Data

Macro Algae:	Location 1: Top/Surface/Floating	Location 2: Middle/Water Column	Location 3: Bottom/Benthic
Location (top, middle, bottom)			
Depth of Sample			
Optional: Periphyton Thickness (in mm, see scale below)			
Appearance (use analogy)			
Texture (use analogy)			

Periphyton Thickness Scale

- 0 - substrate rough with no visual evidence of microalgae
 - 0.5 - substrate slimy, but no visual accumulation of microalgae is evident
 - 1 - a thin layer of microalgae is visually evident
 - 2 - accumulation of microalgal layer from 0.5-1 mm thick is evident
 - 3 - accumulation of microalgae layer from 1 mm to 5 mm thick is evident
 - 4 - accumulation of microalgal layer from 5 mm to 2 cm thick is evident
 - 5 - accumulation of microalgal layer greater than 2 cm thick is evident
- Actual - Mat thickness can be measured with a ruler

Source: Stevenson and Rier (<http://www.epa.gov/owow/monitoring/rbp/ch06main.html>)

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Student Data Sheet

Location	Algae Observed (drawings of unique types of algae observed in one slide)	Richness (# of different types)
Location 1: Top/Surface/ Floating		
Location 2: Middle/Water Column		
Location 3: Bottom/Benthic		

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Assessment

1. Which location had the highest diversity of algae?

2. What was the difference between the location with the highest number of algae identified and the location with the lowest?

3. Does your data support your hypothesis? Whether your hypothesis is supported or not, what can you infer from your observations, and results? What factors affect the location of algae?

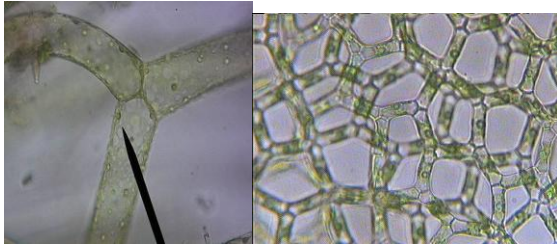
4. If algae are plantlike protists in that they use photosynthesis to produce food and grow, what might happen if the amount of nutrients they receive increases?

5. Nutrients that contribute to the growth of algae come from many different sources. Try to identify some sources of nutrients that might come from the following land uses: farming, residential, recreational lands such as parks and golf courses?

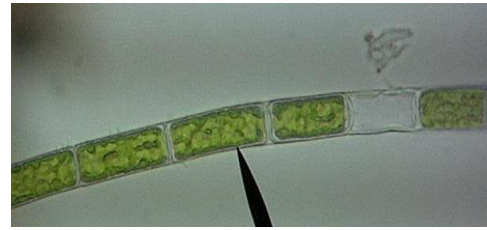
6. Think about what you learned in this lab; has it generated any new questions? Write a new question about something you want to learn more about.

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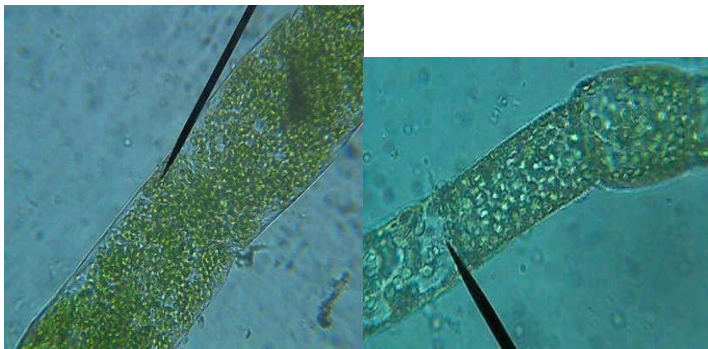
Micro Algae Reference Chart



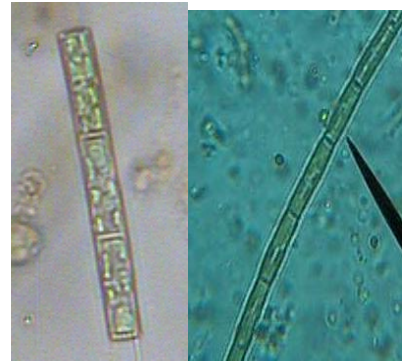
Green Algae (Hydrodictyon)



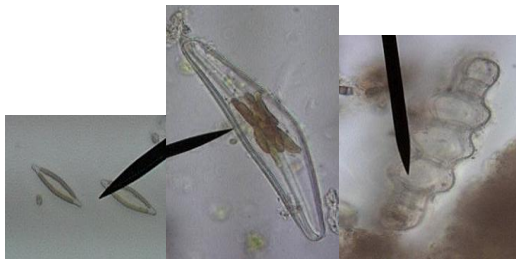
Coscindodicophyceae. (Aulacoseira or Melosira)?



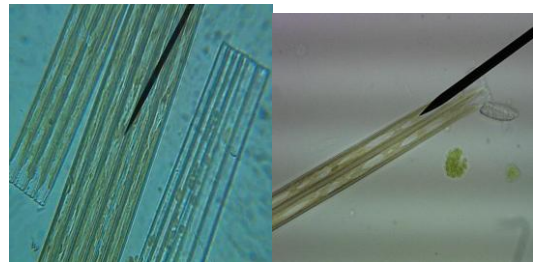
Vaucheria?



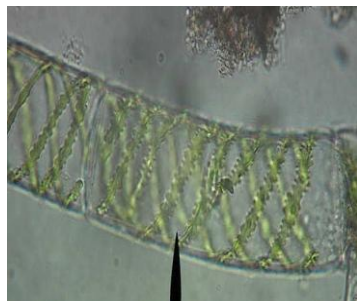
Aulacoseria granulata



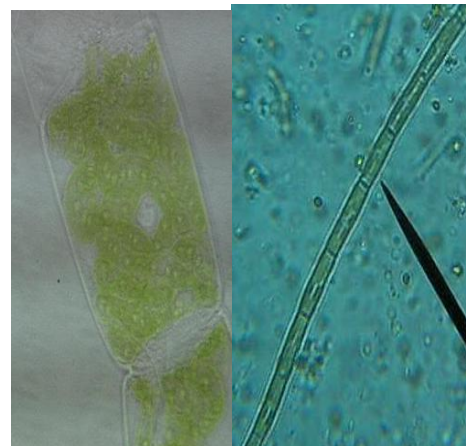
Diatoms Left: (Class Bacillariophyceae); Center: (Family Cymbellaceae); Right (Terspinoe musica)



Diatom Chains (Class Fragilariaceae)



Spirogyra



Unknown