

Bottom's Up

Grade Level: 7-12

Nutshell

Students will investigate the thermal stratification of a temperate lake. By measuring temperature, dissolved oxygen, and light penetration, they will draw a profile of the lake, plot each factor and determine which stage the lake is in its annual cycle. The effect stratification has on the biotic community will be discussed as well as how humans can affect stratification.

Objectives

Upon completion of this lesson, students will be able to:

- define the three thermal layers of a lake;
- use a secchi disk and dissolved oxygen kit;
- explain the annual thermal cycle of a lake;
- give three examples of how thermal stratification affects aquatic organisms
- describe two ways humans can affect thermal stratification.

Resources

Caduto, Michael. Pond and Brook. 1990. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Reid, George. Pond Life: A Guide to Common Plants and Animals of North American Ponds and Lakes. 1987. Racine, WI: Western Publishing Company, Inc.

Bottom's Up Pre-Visit Activities

The following materials are aids to help prepare your students for their visit to the Central Wisconsin Environmental Station. The vocabulary list contains terms and concepts your students will encounter in their visit. Please modify the definitions as needed. The activities listed below are merely options—it is not necessary to do them all or to follow any particular order. Keep in mind that your students' learning experiences at CWES will be enhanced if they are familiar with these concepts and terms prior to the on-site activities.

Vocabulary

Epilimnion: Typically the warmer surface water layer of a stratified lake.

Hypolimnion: Typically the colder bottom water layer of a stratified lake.

Lake: An inland body of standing water which may be natural (formed by glaciers, oxbows in rivers, or other natural processes) or human-made (impoundments such as reservoirs and farm ponds.)

Limnetic: A zone of open water on a lake or pond.

Littoral: Zone from shoreline to the furthest extent of rooted plant growth.

Thermal Stratification: The layering of water due to differences in density caused by vertical temperature zones.

Thermocline: The narrow transition zone between the warmer surface water layer (epilimnion) and the cold bottom water (hypolimnion.)

Activity #1

Research the origin of a lake in your area. Some questions to begin with include: When was it formed? How large is it? What is the bottom made of? What lives in it? Size, shape, and the geology and environmental conditions of its surroundings help determine the individual character of a lake (Caduto 1990.) Have your students write a detailed description of the lake. Does everyone choose the same words in characterizing the lake the class has researched? Why or why not? How do personal values affect the lake characterizations?

Activity #2

Investigate issues related to lakes in your area. Some issues might related to conflicting recreational uses, pollution, etc. Then, as a class, choose a specific issue. In small groups, have students “adopt” viewpoints of various sectors involved in the lake-related issue. Hold a debate to share adopted viewpoints of groups affected by this issue. Decide on possible solutions to the issue. How are different sectors affected by each possible solution? How well do you think the various groups involved might receive suggested solutions?

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Activity #3

Have your class brainstorm a list of all the reasons why lakes are important. Then, watch area newspapers for a few weeks and clip all articles related to lakes. Categorize the news articles by issue or other common threads. Track frequency of publicity on specific issues. Look for possible trends and reasons why certain issues/topics seem to be publicized more than others. Relate this to the student list of why lakes are important. Are there topics that have received no publicity during your investigation time, but you feel need attention? Consider increasing public awareness through personal or group projects.

Activity #4

On butcher block paper, draw a large cross-section of a lake. Have students research the types of organisms that might live in the lake, and what conditions they would prefer to live in (temperature range, cover and shade, depth, etc.) As a class, hypothesize where each of these conditions might exist. For example, where would there be the most light? Where might there be the coldest temperature? Have students create small pictures or signs to represent their organism, and place it where they think the organisms might live within the lake diagram. Save this diagram until after you have visited the Station.

Bottom's Up Resources

A visit to the Central Wisconsin Environmental Station can be a school-year highlight for both students and their educators. We feel the knowledge and concepts gained during a Station visit apply outside the Station as well. The following activities will allow students to expand their knowledge and help them incorporate those lessons into their everyday lives. Feel free to pick from and modify the activities as best suits your group.

Activity #1

Find out about one organism that lives exclusively in the hypolimnion (e.g. bloodworms, anaerobic bacteria, tubiflex worms, or phantom midge larvae) and one that lives exclusively in the epilimnion (e.g. algae or predaceous diving beetles). Contrast their “life conditions” based on what you learned about each layers temperature, dissolved oxygen availability, and nutrients. How do these living things differ from one another? What adaptations do each have to enable them to survive in their respective temperature layers? How common are organisms that use all the thermal layers of a lake to satisfy their needs for life?

Activity #2

Wisconsin has some 14,000 lakes. Find one to get to know better and keep a lake journal of happenings related to it. Do you notice any changes in happenings that you feel good about? That you are concerned about? Discuss your findings. Feel free to use not only personal observations, but observations from others at the lake, as well as newspaper or magazine articles about your lake.

Activity #3

Research how human activities affect lake “health” and water quality in your town/city and state. Find out what your class can do *in their daily lives* to help reduce the negative effects on lakes. Then, do it and let others know about it. Some examples may be turning the water off while brushing your teeth, putting special floats in your toilet tank to reduce the amount of water used when flushing, and making sure that faucets are always turned completely off, rather than left dripping.

Activity #4

Revisit the lake diagram you made during Pre-visit Activity #4. Based on what your students learned while at CWES, would they make any changes? Would their organisms always live in that part of the lake? What other factors might affect an organism’s survival? (people, predators, unusual weather, pesticides or chemicals, etc.) Would different bodies of water have the same characteristics?

You can either end with this discussion or have students delve further into the topic of tolerance and range, and research the presence of their organisms locally. Is the organism present in local bodies of water? Where does it live throughout the country? Does it prefer lakes, streams, marshes, oceans, etc.? Have students report their findings in a presentation or paper.