

# That's the Limit

---

Grade Levels: 7-12

## In a Nutshell

Students will conduct scientific water quality tests to explore the meaning of *range of tolerance*. Students will investigate what roles abiotic (non-living) factors play in determining the physical and, indirectly, the biological characteristics of an aquatic ecosystem. Discussion will focus on how the abiotic factors affect the living aquatic community and the ways humans affect these factors.

## Objectives

After completing this lesson students will be able to

- define *range of tolerance* and *abiotic*;
- list five abiotic factors of a lake community, including pH, temperature, and dissolved oxygen, nitrogen and phosphorous and predict (using the data sheet) what organisms could be present;
- give four examples of how the pH, temperature, or dissolved oxygen could be changed through human influence;
- explain how the abiotic factors together affect the type of aquatic organisms found.



## That's the Limit Pre-Visit Activities

---

Have the students share their examples and limit lines in class and relate them to the concepts of limiting factors and range tolerance.

### Activity #2

Ask the students to consider the problems encountered in space travel. Have them list the limiting factors present in space which must be overcome by engineers, scientists, and astronauts in order for people to survive in that environment (where there is a lack of oxygen, bitter cold temperatures, lack of air pressure and food supply). Produce a master list on the chalkboard. Label the abiotic factors with an "A" and the biotic factors with a "B." Discuss the following questions:

- What is the difference between abiotic and biotic factors?
- How do humans overcome these problems (limiting factors) in space?
- Could other animals or plants do the same? Why or why not?
- How is the earth similar to a spaceship?

### Activity #3

Learn about what thermal pollution is and what causes it. Following your on-site activities at the Central Wisconsin Environmental Station, continue this activity (see Post-Visit Activity #3).

# That's the Limit Post-Visit Activities

---

*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

Preface this activity by emphasizing the point that human activity often affects limiting factors. When humans alter the levels of limiting factors, plants, animals, and other living things are consequently affected.

Explain to the students that they will be investigating one of two issues: acid rain or human population growth. In both of these issues, controversy exists over the extent to which human activity is affecting limiting factors (and therefore other living things on earth). According to many, acid rain may be a by-product of some industrial operations. It has been attributed to changing the pH of aquatic habitats and therefore altering its suitability for populations of living things previously (naturally) found there. The second issue, human population growth, is said by many to be straining the limits in which human activity (in this case, growth) can continue unaffected.

Divide the class into four groups, two groups for each issue. For each issue, one group is assigned the “prosecution side,” implicating humans as those that cause limiting factor changes. The other group, the “defense,” should attempt to show that human impact is minimal or that humans will find a way to avert or resolve the suspected crisis.

Tell the students that their job will be to research the topic and prepare a “case” supporting the position they have been assigned. Their cases will be presented at a mock trial held to indict or acquit human activity of present or future harm with regard to these issues. Have students not presenting the case to serve as a jury. As a group, explore ways that the issues may be solved or ways that problems may be diminished.

## Activity #2

Discuss the idea that the quality of the lives people lead and the environments in which people live are constantly changing as a result of human activity. Some activities result in changes for the good, while other activities have detrimental effects. Have the students think about some of these changes. Discuss these changes as a group.

Explain to the students that, with the changes (good and bad) resulting from human activity in mind, they are to write a two-page fictional story about what life will be like in the year 2100. Point out that there are obviously no “right” or “wrong” ideas. When the

---

**Central Wisconsin Environmental Station**

University of Wisconsin ~ Stevens Point  
10186 County Road MM ~ Amherst Junction, WI 54407

## That's the Limit Post-Visit Activities

---

stories are completed, have volunteers share their work with the class. Make a list on the blackboard of potential positive and negative changes resulting from human activity in the next 100 years. Discuss with students the following questions:

- How can you and I promote these positive changes in our lifetime?
- How can we work now to prevent or minimize negative changes and their results?

### Activity #3

Using what you learned about temperature and dissolved oxygen during your visit to the Central Wisconsin Environmental Station, predict the effects that thermal pollution would have on aquatic environments and life found in those environments. Then, conduct research to determine whether or not your predictions are correct. Next, find out how thermal discharges into bodies of water in your local area are monitored and controlled to minimize negative environmental effects.

# That's the Limit Resources

---

**Teacher Resources**

**Youth Literature**

---

**Central Wisconsin Environmental Station**

University of Wisconsin - Stevens Point  
10186 County Road MM - Amherst Junction, WI 54407