

Science Essential Standards:

- 3.E.2.1 (landforms)
- 4.L.1.1, 4.L.1.2, 4.L.1.3 (animal adaptations)
- 5.L.2.1, 5.L.2.2, 5.L.2.3 (ecosystems)

Time:

45 minutes

Audience:

3rd, 4th, or 5th grade

Learning Objective:

Recognize the diversity of life present in a lake and how water quality impacts what animals and plants are able to live in a lake ecosystem.

Materials:

- zooplankton nets
- small containers
- Private Eyes or magnifying glasses
- Secchi disk
- thermometer
- pH test strips
- microscope

Vocabulary:

biodiversity, consumers, decomposers, food web, phytoplankton, producers, turbidity, water quality, zooplankton

Preparation:

- ✓ Familiarize yourself with the area where you will be bringing students. Check the area for poison ivy and other potential hazards.
- ✓ Determine safe boundaries where the students will investigate the lake.
- ✓ Check to be sure you have all the materials needed for the lesson.
- ✓ Know how many students are in your group.
- ✓ Be prepared to share a fact or two about this lake with students.

Background:

Life churns beneath the surface of a lake. Every drop of water in a lake is full of hundreds of living things, many microscopic. That microscopic life is one of the main causes why lake water is usually cloudy in appearance. Sediment can also add to the cloudy appearance and color of a lake.

A **food web** shows the flow of energy in an ecosystem from producers to consumers to decomposers. **Producers** are organisms which produce their own food using the sun's energy. **Consumers** get their energy by eating producers and other consumers. **Decomposers** break down dead organisms into smaller and simpler parts which makes nutrients available for producers.

A lake food web includes producers (algae, phytoplankton), consumers (zooplankton, mussels, fish), and decomposers (fungi, bacteria). **Plankton** are microscopic organisms that live in the water. **Phytoplankton** are plankton that are plants, whereas **zooplankton** are animals. Phytoplankton make their own energy using photosynthesis, a process that uses sunlight to create food in the form of sugar. Zooplankton eat phytoplankton for their energy. **Biodiversity** is the variety of species on earth or in an ecosystem, including plants, animals, bacteria, and fungi that interact with one another. A healthy lake ecosystem has high biodiversity.

Water quality is important for all aquatic species as it is a measure of how clean and healthy the water is. Different organisms have different tolerances to water quality characteristics including pollution, dissolved oxygen, turbidity, and pH levels. Taking varying measurements of these characteristics from a sample of water can create a snapshot in time of what the quality of that water is at that particular time. Looking at the organisms that live in the water can add to that picture.

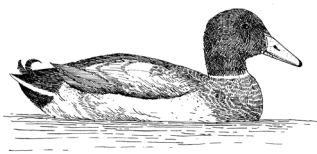
Turbidity is a measure of the cloudiness of the water due to particles floating in the water. If the turbidity of the lake water is too high, producers will not get enough sunlight to carry out photosynthesis. Other organisms that are dependent on these producers will suffer as well.

Instructions:

1. Greet the students and explain the **learning objective** of this activity. *Ask students to give you a thumbs up if they have ever been to a lake before.*
2. **Explain** to students that a lake is full of a variety of life forms.
 - a. Point out that they likely know that there are fish living in the lake. Explain that there are also thousands of different kinds of plants and animals living in the lake.
 - b. Explain that some may be large, such as fish, while some are too small for the eye to see, such as plankton.
 - c. **All these animals and plants make up the lake “soup” of life.**
3. *Ask students what other life forms they might find in the lake.* Examples include ducks, clams, algae, turtles, birds, and bacteria. *Ask students if they know a term that is used to describe this variety of life in a habitat. Biodiversity!*
4. Share with students a fact or two about the specific lake being used for this program.
5. Remind/explain to students that a food web exists in a lake ecosystem. *Ask students to explain a food web in their own words.* After accepting a few answers, explain or confirm that a **food web** shows how energy moves through an ecosystem.
 - a. **Note:** If the group is **3rd or 4th graders**, use the term **“habitat”**. If the group is **5th graders**, use the term **“ecosystem”**.
6. **Organisms** are classified within an ecosystem according to their function. The three classes are producers, consumers, and decomposers.
 - a. **Producers**, such as algae and **phytoplankton**, use the sun’s energy for **photosynthesis**.
 - b. **Consumers**, such as **zooplankton**, fish, and birds, eat producers and other lower-level consumers.
 - c. **Decomposers**, such as fungi and bacteria, break down dead material to return the nutrients to the ecosystem.
 - d. The **interconnection** of producers, consumers, and decomposers creates a **food web**.
7. Tell students that today they will be looking for **plankton** and testing the **water quality** of the lake.
 - a. *Ask students to define plankton.* Plankton are tiny organisms that live in water.
 - b. *Ask students to explain water quality.* Water quality is a measure of how clean and healthy the water is.
8. Break students into groups and give each group a plankton net. **Model** how one student will hold the end of the rope while another throws the net into the water. **Model** how to transfer samples into a container. Students can use magnifying glasses to examine the plankton in their containers. Remind students that they might not be able to see all of the organisms they are capturing.
9. *Ask for student volunteers to test the temperature and pH of the water.* If the water is too warm, many organisms might not be able to live there. The pH of the lake should be between 6.5 and 8.5. If the pH is too low, the water may be too acidic for lifeforms.
10. Test the turbidity. **Turbidity** is a measure of the cloudiness of the water due to particles floating in the water. Students can take turns lowering the Secchi disk into the water to see when it disappears. Explain to students that high turbidity can harm producers if they can’t get enough sunlight.
11. *Ask students how humans might harm the water quality.* *Ask for examples of how they can help improve the water quality.*
12. Discuss grade level specific aspects of the activity:



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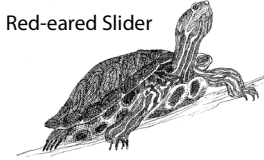
Mallard (male)



Minnow

- a. **Landforms for 3rd graders** - Compare lakes to other bodies of freshwater and discuss differences between freshwater and saltwater.
- b. **Animal adaptations for 4th graders** – Describe various physical and behavioral adaptations of the animals that were observed.
- c. **Ecosystems for 5th graders** – Connect the organisms observed to food chains and webs, especially their role i.e. consumer or decomposer. Discuss the interconnectedness of the lake, the organisms living in it and near it, and humans.

Red-eared Slider



Opportunities for Extended Learning:

- If materials are available, testing dissolved oxygen content of the lake water could also be conducted.
- Consider incorporating a game into the 5th grade discussion of food webs. Options that could be modified for a lake ecosystem include *Web of Life*, *Pyramid of Life*, and *Rock, Paper, Ecosystems* can be found on the Schools in Parks Teacher Collaborative website at <https://ie.unc.edu/nc-state-park-teacher-collaborative/>. Substitute organisms from a lake, such as zooplankton, minnow, and osprey.

Behavior & Materials Management Tips:

- ◆ Give students **clear, defined boundaries** for where they can go to collect water.
- ◆ Assign each student **a role**, so they will be on task.
- ◆ Remind students to **take turns** using the net and other materials.
- ◆ When groups are assigned, give the groups a minute **to connect**.
 - For example, have them give each team member a fist bump or choose a team name.
 - Give them a clear, brief time limit for this activity. For instance, ask students to take 45 seconds give each team member and their chaperone a high five.
- ◆ **Model the behavior** to your students as you expect them to behave.
 - Students are more likely to meet expectations if have clearly been shown what they are.
 - Have the students then model the behavior back to you to reinforce the behavior.

References & More Information:

National Geographic Society. (2012, October 9). Food Web. Retrieved from <https://www.nationalgeographic.org/encyclopedia/food-web/>

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United States Geological Survey. (n.d.). Turbidity and Water. Retrieved from https://www.usgs.gov/special-topic/water-science-school/science/turbidity-and-water?qt-science_center_objects=0#qt-science_center_objects

Credits:

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