



## PLANKTON OUTDOOR LAB TEACHER'S GUIDE

**Learning Goal:** Understand the role of plankton in the lake food web and distinguish between various types of freshwater plankton.

**Objectives:**

- Safely conduct plankton netting studies to collect and identify various forms of plankton.
- Understand plankton's importance in aquatic energy relationships.
- Practice using a microscope to examine plankton from lake water samples.
- Distinguish between zooplankton and phytoplankton.
- Identify *Daphnia*, cyclopoids, diatoms, algae.

**Note:** To prepare for this outdoor lab, set up folding tables with microscopes and plankton identification guides. Sunny locations are optimal because more light enters the microscopes. Tables should have the microscopes, slides, droppers, hand lenses ready for students to examine their samples. You will also need to identify a nearby location, such as off a dock, for them to use plankton nets to collect their samples. Collect a sample prior to the field trip so you can prepare a few example slides ahead of time to show various plankton types in case of low plankton levels in student samples.

1. Introduce the instructors and leaders for the session.
2. The module leader(s) should briefly review plankton types and their role in the aquatic food web.
  - There are two big groups of plankton (phytoplankton and zooplankton). Point out that animals are found in zoos and “zoo” refers to animals. For phytoplankton, point out that “phyto” refers to “light” and refers to the process of photosynthesis.
  - Ask students which of the two types of plankton are able to photosynthesize. Remind them that plants photosynthesize and are most often green, from chlorophyll. The presence of green would indicate that you are looking at a type of phytoplankton.
  - Phytoplankton use energy from the sun during photosynthesis and are the base of the lake food chain. Ask students what sort of organisms might eat phytoplankton? How would that energy be transferred to the next trophic level, or up the food chain? In general, zooplankton are the key consumers of phytoplankton (some fish and larger organisms eat phytoplankton). Zooplankton use the energy in phytoplankton to grow and survive. Many juvenile fish and smaller prey fish, like bluegill, and minnows, survive on zooplankton. Larger predator fish will eat the smaller prey fish and the energy continues up the chain. Students may also link terrestrial animals to the food chain. An eagle, bear, and other mammals are predators of fish. This is an important transfer of energy that originated in the lake ecosystem to land ecosystems.
3. Demonstrate the methods for sampling plankton and show students the approved location(s). Make sure students are wearing properly fitted life jackets.

4. Have students work in pairs to collect plankton from the sampling location. Make sure each person in the group has the opportunity to use the equipment, if desired. Once the students have their samples, have them take their bottles to the tables with the microscopes.
5. Demonstrate the use of microscopes and assist students as they look for plankton in their samples. Show students how to clean slides and where to dispose of broken glass. Have students refer to the pictures for identification of the common types of plankton found in the lake water sample.
  - Students will be looking for phytoplankton (algae and diatoms) and zooplankton (*Daphnia* and copepods).
  - Before looking at the sample, give students some tips. For example, if the organism is moving, it is a type of zooplankton. If it is green, it is most likely phytoplankton (although zooplankton can have phytoplankton in their stomachs). Both *Daphnia* and copepods have eyes, which would indicate they have found zooplankton. When identifying diatoms, look for geometric and symmetrical forms.
6. As students are looking at their samples, guide them in their use of the microscopes:
  - Show students how to maximize the light on their slides.
  - Point out there are four different settings for the magnification level. Remind students that they will not be using the oil immersion setting. Going to this setting without oil can be harmful to the microscope or could crush their slide.
  - Show them how to use the dials on the side to focus on the organisms.
  - Show how to use the pipette to collect lake water from the larger sample. Carefully squeeze one drop onto the slide. Point out that the cover slip is what holds the water in place on the slide. Show them how to angle the cover slip on one end and then releasing the cover slip over the sample to reduce the air bubbles that form in the prepared slide.
  - Demonstrate how to load the slide that will contain their lake water sample.
7. While students are prepping their slides, have an instructor or volunteer set up samples on additional microscopes to allow students to rotate through the prepared microscopes and identify organisms they could not find on their own. It is especially beneficial if there are dissecting microscopes available so that you can demonstrate the differences between the equipment.
8. Instruct students to record which plankton they have found. As students correctly identify the various types, initial their lab books in the corresponding space.
9. Be sure to leave time to discuss the critical thinking question at the end of the lab, focusing on the important role plankton play in our global environment (review points in #1 above). Make sure students record these ideas in their lab packets.
10. Students should be directed to clean-up their slides and samples before the session ends.