

Kim Duffy  
Spring 2001

## **Algae Part One: An Introduction**

### **Abstract:**

During the lesson students will have the opportunity to view two types of algae (fresh water and Great Salt Lake species) under 400x magnification with a compound microscope. Students will make observations and record their observations on a recording sheet where they will describe what they see through drawing and words. The students will learn to identify different qualities such as cell structure, movement and other behavioristic qualities of the two different types of algae.

**Grade Level:** 3rd

### **Utah Elementary Core Curriculum Standards:**

**Standard 3030-01:** Students will explore ecosystems and discover relationships among living organisms and the nonliving world.

Objective 3030-0101: Compare and contrast similarities and differences of various habitats.

- Observe and describe a variety of habitats.
- Distinguish living and nonliving elements of different habitats.

Objective 3030-0102: Identify the relationships among living organisms in a habitat.

- Experiment to determine the effects of habitat changes.

**In -class instructional time:** 30 minutes

### **Terminology :**

Alga(e)- An aquatic organism that carries on photosynthesis. Primary producers of aquatic ecosystems.

Cell- The basic sub-unit of life (all living things are composed of cells). The smallest structure capable of performing all the processes necessary for life.

Habitat- Place where an organism lives and reproduces.

Organism- A living being, may be single-cellular or multicellular.

### **Intended Learning Outcomes:**

- Students will compare and contrast two types of algae.
- Students will analyze cell structures.
- Students predict the effects of altering a algae's habitat

### **Background:**

Algae are critical to every aquatic ecosystem because they are the primary producers of the ecosystem. Like plants, they make their food by photosynthesis using energy from the sun, and other organisms get their energy by eating the algae. They can be single-cellular and microscopic, but visible in colonies. Some species are

multicellular and may appear as long filaments. They may give water a green appearance in the summer.

One type of algae that thrives in hypersaline environments like Great Salt Lake is *Dunaliella viridis*, a green species that is unicellular, has flagellae, and it is an important food source for brine shrimp and brine flies. The algae is abundant in summer. It may live on the lake bottom and form rock-like structures called algal bioherms, which look like coral reefs. Many brine fly pupae attach themselves to the algal bioherms.

*Dunaliella viridis* are adapted to a salty environment, at least twice as salty as the oceans.

Freshwater algae is different from Great Salt Lake algae in that it does not have the adaptations necessary to survive in salty water. Fish and insects may dine on the many different species that inhabit our creeks, lakes, ponds, and rivers.

### **Materials:**

- Algae taken from two different sources. This lesson uses algae from an extremely salty habitat (Great Salt Lake) and algae taken from a freshwater habitat (a local creek). Algae may be collected from any aquatic source including oceans and fish tanks. The point is to find two distinctly different species from different habitats.
- Microscopes and microscope slides
- Tweezers
- Photos showing the algae magnified
- Algae Worksheet worksheet (included below)

### **Prior Knowledge Assessment:**

Assess students' prior knowledge by asking students to write down what they already know about algae. Use these written responses to generate discussion and lead into the following activity.

1. Have students gather around and show Microscope images or books with photos of various types of algae. Also, to focus on cell structure, the students should have available a diagram showing cell structure and the labeled parts of a cell.
2. Students will then draw and describe the different types of algae on their own paper. They should label cell structures like the cell wall, cell membrane, vacuoles, and chloroplasts in their picture.
3. The teacher will then explain characteristics of algae (see background) and its importance in aquatic ecosystems. Show pictures of the animals that depend on it as a food source.
4. Students will then make their own slides to view the algae, from at least 3 provided samples, with a microscope (under 400x magnification) and record their observations.
5. Students will complete a Algae Worksheet of their own for assessment.
6. Have students make predictions about what they think will happen to the algae if you were to alter the algae's natural habitat by moving the freshwater algae into saltwater and moving the saltwater algae into freshwater. Have students describe as well as diagram their predictions on the sheet included below (Prediction Sheet). This will set up their thinking for the experiment intended to follow this lesson (see below).

**Assessment strategies:**

Self assessment and Algae Worksheet

The criteria could include:

*Self assessment*- Effort , Participation, Observations

*Algae Worksheet*- Completeness, Evidence of thought put into the assignment as noted by quality of answers to questions, Neatness.

## Algae Worksheet

Student Name:

Name of topic:

Describe the physical characteristics of your algae:

What is the habitat of this organism?

How does it make its food?

Give an example of an animal which eats it.

Give two other interesting facts:

### **Prediction Sheet**

When an organism's habitat is changed in some way (altered) there can be negative or positive outcomes. Describe what you think will happen if we move the Great Salt Lake algae into freshwater for a period of one week and move the algae from Emmigration Creek (freshwater) into Great Salt Lake water.

Please describe and/or diagram what you think may happen as a result of these changes:

Diagram:

## **Algae Part Two: A Habitat Switching Experiment**

### **Abstract:**

Following the introductory activity, students will observe, diagram, and write about the survival of Great Salt Lake and freshwater algae species placed in altered habitats. Students will help prepare slides of algae in water of their natural habitat and a foreign habitat. After observation, the students working in groups will decide how well the cells are surviving.

**Grade Level:** 3<sup>rd</sup>

### **Utah Elementary Core Curriculum Standards:**

**Standard 3030-01:** Students will explore ecosystems and discover relationships among living organisms and the nonliving world.

Objective 3030-0101: Compare and contrast similarities and differences of various habitats

- Observe and describe a variety of habitats
- Distinguish living and nonliving elements of different habitats.

Objective 3030-0102: Identify the relationships among living organisms in a habitat.

- Experiment to determine the effects of habitat changes.

**In -class instructional time:** 30 minutes

### **Terminology:**

Alga(e)- An aquatic organism that carries on photosynthesis. Primary producers of aquatic ecosystems.

Cell- The basic sub-unit of life (all living things are composed of cells). The smallest structure capable of performing all the processes necessary for life.

Habitat- Place where an organism lives and reproduces.

Organism- A living being, may be single-cellular or multicellular.

### **Intended Learning Outcomes:**

- Students will recognize effects of habitat change on a organism.
- Students will analyze cell structures.
- Students will reflect upon their prediction of the effects of altering an algae species' habitat.

### **Background:**

Algae are critical to every aquatic ecosystem because they are the primary producers of the ecosystem. Like plants, they make their food by photosynthesis using energy from the sun, and other organisms get their energy by eating the algae. They can be single-cellular and microscopic, but visible in colonies. Some species are multicellular and may appear as long filaments. They may give water a green appearance in the summer.

One type of algae that thrives in hypersaline environments like Great Salt Lake is *Dunaliella viridis*, a green species that is unicellular, has flagellae, and it is an important food source for brine shrimp and brine flies. The algae is abundant in summer. It may live on the lake bottom and form rock-like structures called algal bioherms, which look like coral reefs. Many brine fly pupae attach themselves to the algal bioherms.

*Dunaliella viridis* are adapted to a salty environment, at least twice as salty as the oceans.

Freshwater algae is different from Great Salt Lake algae in that it does not have the adaptations necessary to survive in salty water. Fish and insects may dine on the many different species that inhabit our creeks, lakes, ponds, and rivers.

### **Materials:**

- Algae taken from two different sources. This lesson uses algae from an extremely salty habitat (Great Salt Lake) and algae taken from a freshwater habitat (a local creek).
- Microscopes and microscope slides with coverslips
- Tweezers
- 12 plastic collection containers 6 filled with freshwater and 6 filled with Great Salt Lake water and labeled with colored tape

### **Introduction:**

1. Discuss the significance of an organism's habitat. How might a drastic change in one aspect (salinity in this case) affect the organism?
2. Have the students generate predictions (a hypothesis) and record them on a lab report. What will happen if freshwater algae cells are placed in salt water? What about salt water algae cells that are placed in freshwater?
3. Just prior to the experiment, set up four different algae microcosms in plastic cups or containers covered with plastic wrap and rubber bands. Since the algae cells will not survive in the reciprocal habitat, do not do this too far in advance. To maintain accuracy, scientists repeat each experiment at least 3 times. Therefore, make three groups of each set of four.
  - i. Freshwater algae in freshwater
  - ii. Freshwater algae in Great Salt Lake
  - iii. Great Salt Lake algae in Great Salt Lake water.
  - iv. Great Salt Lake algae in freshwater.
4. Have students as a group prepare a slide of the four different habitats, being careful to note from which collection jar the sample is taken.
5. Have students observe and discuss the characteristics of the algae being viewed on each slide, first looking at the algae in its natural habitat, then the same algae in its foreign habitat.
6. Have students diagram and describe their observations (results) in their lab report.
7. Students will then address whether or not their predictions aligned with the outcome of the experiment or state the discrepancies and why they think they occurred.
8. Have students share their conclusions. Underscore that scientists do not consider hypotheses to be right or wrong, the predication just helps to structure the experiment. If a student's results do not match the hypothesis, the student must reject the hypothesis, but it is not "wrong."

### **Assessment strategies:**

Group assessment and completion of the lab report.

The criteria could include:

*Group assessment-* Effort ; Participation, Observations and cooperation

*Lab Report-* Completeness, Evidence of thought put into the assignment as noted by quality of answers to questions, Neatness and evidence of reflection upon original predictions or supporting data for their statements

### **Resources**

Anderson, P., et al. The Great Salt Lake An Inte disciplinary Activity Guide. Utah Museum of Natural History 1995. Available for check out through USEE-Utah Society for Environmental Education 350 South 400 Eaast, Suite G4 SLC, UT 84111 (801) 328-1549.