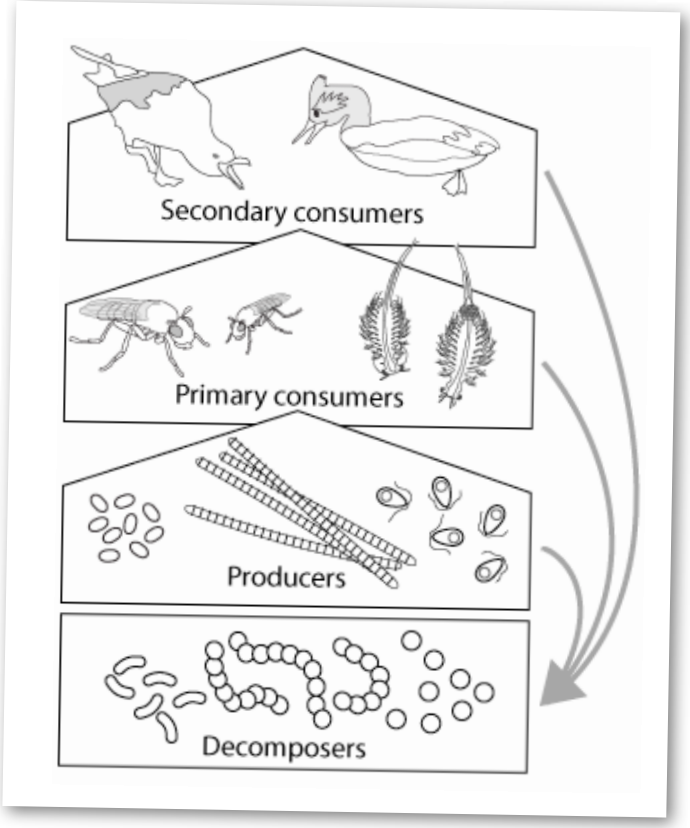
WINOGRADSKY COLUMNS

Teacher Guide

BACKGROUND

Microbes are an essential part of healthy ecosystems all around the world. Microbes help to decompose plants and animals that have died, breaking them down into usable nutrients. Some microbes collect energy from the sun and release oxygen into the atmosphere. Microbes convert nitrogen from the atmosphere into a form that our bodies can use. Many types of microbes serve as food for animals higher in the food chain.



Microbes are important producers and decomposers in the Great Salt Lake food chain.

Just like other living organisms, each type of microbe has specific requirements for life: certain types of nutrients; a comfortable range of temperatures; the right salinity, pH, light conditions, etc. As these abiotic factors vary, they support different types of microbes.

The Great Salt Lake ecosystem contains several microenvironments, each with its own special characteristics and unique population of microbes. Even though microbes are too small to be seen with the unaided eye, you don't always need a microscope to know that they are there. For example, the microbes in the hyper-saline North arm of Great Salt Lake turn the water pink; the microbes in the less saline South arm turn the water green.

Winogradsky columns provide a great way to observe and compare some of the microbes that live in different places around the lake. The microbes already present in soil and water samples will grow and flourish Inside the columns. Over time, the columns develop colorful layers and zones, each with a unique population of microbes that have different requirements for life.

FUNDING

Funding for this module was provided in part by Westminster College and by a grant awarded under the Workforce Innovation in Regional Economic Development (WIRED) Initiative as implemented by the U.S. Employment and Training Administration.

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BEGIN

1. List some of the abiotic factors that might vary from place to place around Great Salt Lake.

   You may want to generate this list as a class. Ideas include:
   - *Salinity*
   - *Light*
   - *pH*
   - *Temperature*
   - *Oxygen levels*
   - *Pollution*
   - *Nutrients*

2. Which of the factors listed above do you think are different between your two sample sites?

3. Which of the factors listed above do you think are the same?

4. Will you add any nutrients to your column(s)? If so, what will you add?

   You may wish to assign this, or let students choose their own with minimal overlap.
   You may want to limit nutrients to 1 or 2 per group. See Table 1 on the web page for guidance.

5. How will you incubate your column(s)?

   Help your students decide how they will incubate their columns. See Table 2 on the web page for guidance.

6. What observations will you write down?

   Suggestions include color, smell, layers, bubbles, macroinvertebrates, evidence that the slow-release carbon source is decaying.

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BUILD YOUR COLUMNS

First add your slow-release carbon source (if using).

1. You will need the following materials:

   - ☐ Column container(s)
   - ☐ Lid, Parafilm, or plastic wrap
   - ☐ Mixing container: bucket, basin, or bowl
   - ☐ Ladle or large spoon
   - ☐ Funnel (if needed)
   - ☐ Permanent marker
   - ☐ Gloves
   - ☐ Safety goggles

2. Label your column(s) with the following:

   - Your name
   - Today's date
   - Where the sample came from

3. If you are using a slow-release carbon source, add it to the bottom of your column(s) (see drawing above).

4. Put your sediment sample into your mixing container. Estimate how much sediment you will need to fill your column container 2/3 full, and take only as much as you need.

5. Remove stones, sticks, and leaves.

6. Add water to your mud and stir until the sample is about as thick as a smoothie. Try not to make any bubbles.

7. Add the nutrients (if any) you listed on the bottom of page 2. Stir well to mix.

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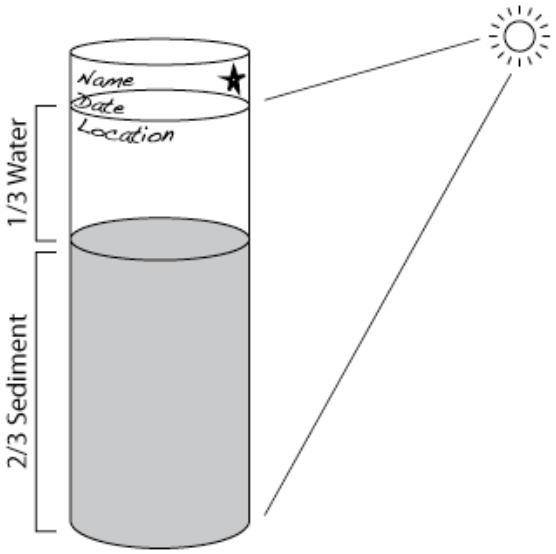
8. Put the mixture into your column container until it is about 2/3 full (see drawing at right). Use a funnel if you need to. Tap the column container to help air bubbles float to the top (you don't want air bubbles in your column).

9. Add water to your column container until it is about 1 inch (2 cm) from the top. Be sure to use water from the same place your sediment came from.

10. Cover your column with a lid, Parafilm, or plastic wrap.

11. Rinse your mixing container and any tools that have sediment on them.



Turn the star toward the light.

12. Repeat steps 4–11 with your next sediment sample (if you are building more than one column).

13. Incubate your column as you described on page 2, question 5.

14. If your column will be in the light, draw a small star on the side of the column that is turned toward the light source. If you move your column, make sure you put it back with the star turned toward the light (see drawing above)