

ACTIVITY

4

THE LAYERED LOOK

A DEMONSTRATION OF THE DISTRIBUTION OF FRESH AND SALT WATER IN AREAS WHERE FRESH AND SALT WATER MEET IN ESTUARIES.

SCIENCE SKILLS:

- observing
- predicting
- communicating

CONCEPTS:

- Stratification occurs in estuaries where fresh water meets salt water.
- Fresh water will tend to flow above the saltwater layer.
- Some mixing occurs where the two layers meet.

SAMPLE OBJECTIVE:

- Students will be able to describe and explain the distribution of salt and fresh water in an estuary.

INTRODUCTION:

An ESTUARY is defined as a semi-enclosed body of water where incoming seawater is diluted with fresh water coming from the land. Because of the differences in weight (density) between fresh and salt water, salt water will move upstream in the estuary along the bottom, while fresh water will flow downstream along the surface. This causes a layered condition. Some mixing occurs at the interface where fresh and salt water meet. The layered condition is said to be STRATIFIED. This teacher-led demonstration illustrates the stratification that may occur in estuaries. You can go directly from this activity to Activity 5 as this is the set-up for the next demonstration. *The thin separator tank from Concepts of Science for the fifth grade may be used in this activity.*

MATERIALS:

- colored markers or crayons
- 2 clear plastic containers such as sweater boxes or small aquaria; may use clear glass 1 gallon jars or large glass or plastic bowls
- 2 siphons - clear plastic tubing (see Recipes)
- 1/2 gallon of clear aged fresh water
- 1/2 gallon of aged fresh water with 8 drops of green food coloring
- 1/2 gallon of clear aged salt water (1 cup salt per gallon) (see Recipes)
- 1/2 gallon of aged salt water (1 cup salt per gallon) with 8 drops of green food coloring (see Recipes)

LESSON PLAN:

BEFORE CLASS: Gather all materials. Make up the saltwater solutions and label bottles. This exercise works best as a teacher-led demonstration so plan a spot where all the children have a clear view on a solid surface that they cannot move as they crowd around. Aged water which has been sitting open at least overnight insures that the next activity will not hurt the animals.



DURING CLASS:

METHODS: Start by asking the students what happens when salt water meets fresh water. They may remember from Activity 2 that salt water and fresh water mixed give BRACKISH water. After Activity 3, they may also suggest that the heavier salt water will settle near the bottom, while the fresh water floats near the top.

Let's see what happens when a large body of salt water meets fresh water in a model ESTUARY. Have the students place themselves so that they can see without bumping the demonstration.

Fill one container 1/3 full with clear aged fresh water. Then slowly siphon in the colored salt-water solution, keeping the siphon tube near, but not on, the bottom of the container. A colored salt solution layer will form on the bottom of the container. Have a student hold this siphon while you do the reverse with clear salt water and colored fresh water in another container. You should end up with two stratified systems with the color on top in one and on the bottom in the other. The best way to see this is to look from the side, not the top.

RESULTS:

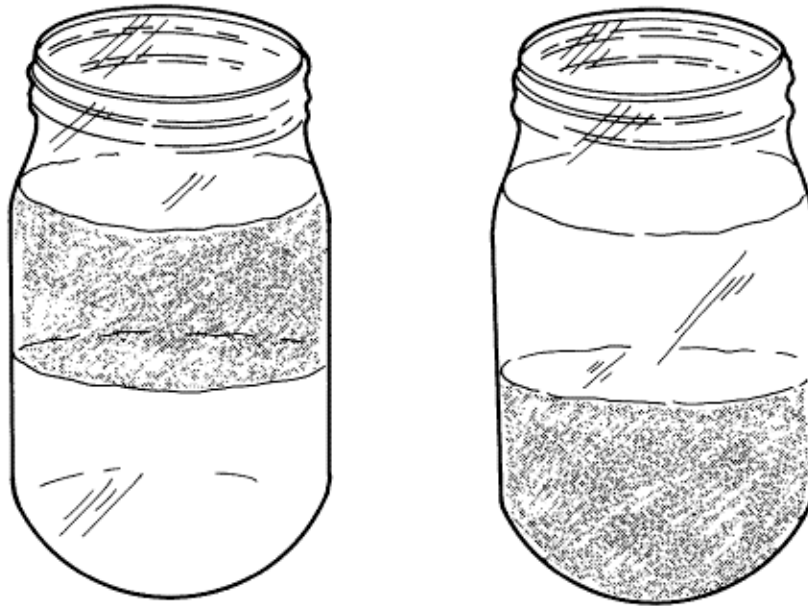
Ask the students to observe the containers of water. Questions to get a discussion going might include: How many layers formed? Two. Which layer is salty? Bottom. Which layer is fresh? Top. Are they completely separate? No. Is something happening at the interface between the two layers? Yes. What? Mixing is occurring. What would happen if one measured the salinity at differing depths from surface to bottom in an estuary? Salinity would increase with depth.

Why did we do this twice? The food coloring added a second variable. When it was used in the reverse order in the second experiment, you proved it was not the cause of the results.

Have the students record the results on their data sheets, using crayons or markers to indicate the location of the colored water layer. Have them label each layer of water in each container, and then fill out the rest of the data sheet.

CONCLUSIONS:

Because salty water is more dense than fresh water, it sinks below fresh water when the two come into contact. While there is some mixing at the boundary, a stratified system with regard to salinity is formed. The distribution of salinities in an estuary reflects this relationship.



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Name Possible answers

State the question you are trying to answer by observing this demonstration.

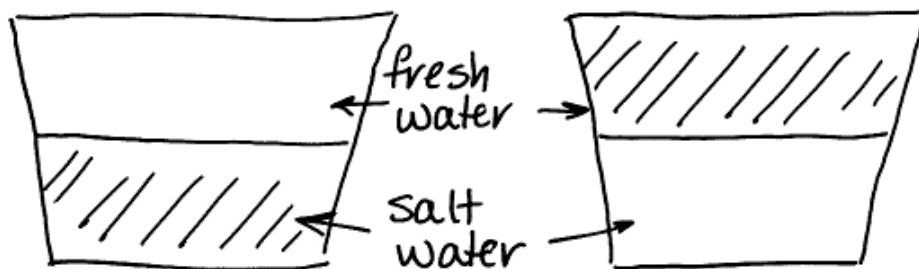
What happens when salt water and fresh
water are gently added to each other?

What might happen where a river meets
the sea?

Draw the results of the demonstration here:

First tank or jar

second tank or jar



Based on the results of this demonstration, where would you expect to find the saltiest water if you were studying the mouth of a river where it formed an estuary as it meets the ocean? The top of the water or the bottom?

I would expect the salt water to be on the
bottom. If the water were mixed, maybe
by the wind, the two kinds of water might
mix as it did when John kept bumping
the table.

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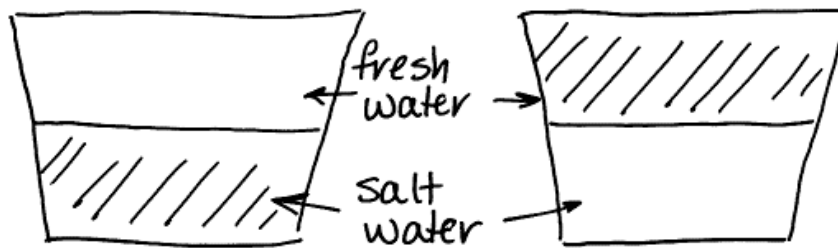
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