

Upwelling Activity

What happens to cool, deep water when the warm surface water is moved away?

In the ocean, winds can push water away from the surface allowing deep, cool, nutrient-rich but oxygen-poor water to rise, bringing nourishment to plankton, the basis of the oceanic food web. This process of upwelling is essential to ocean productivity.

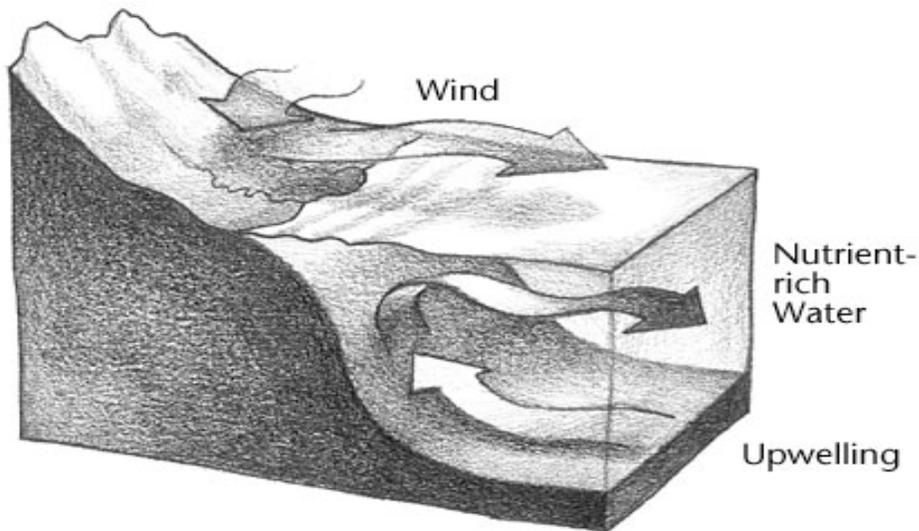
Concept Wind patterns and currents may cause water to rise from deeper areas.

Objectives To demonstrate the process of upwelling

Content Science, language arts

Background Dense, cold water is normally found deep in the ocean. Remains of dead, decomposing organisms sink to the ocean bottom making these deep, cold waters rich in **nutrients**. However, it is in the upper, sunlit layers of the ocean that **phytoplankton** (very small drifting plants) are able to utilize these nutrients with energy from the sun, and thus create a basis for oceanic food webs.

The process of **upwelling** brings nutrients nearer to the surface. Upwelling occurs near some continental areas when offshore winds move surface water away from the shoreline, allowing cooler water to rise or upwell. Where upwelling occurs, marine life is rich.



Periodically, the winds that move surface water away from the shore cease to blow. Upwelling fails, and the marine food web is disrupted. In addition, warmer surface water creates clouds, leading to increased rainfall over the land. This phenomenon, known as El Niño, creates situations of global consequence for many life forms.

Materials

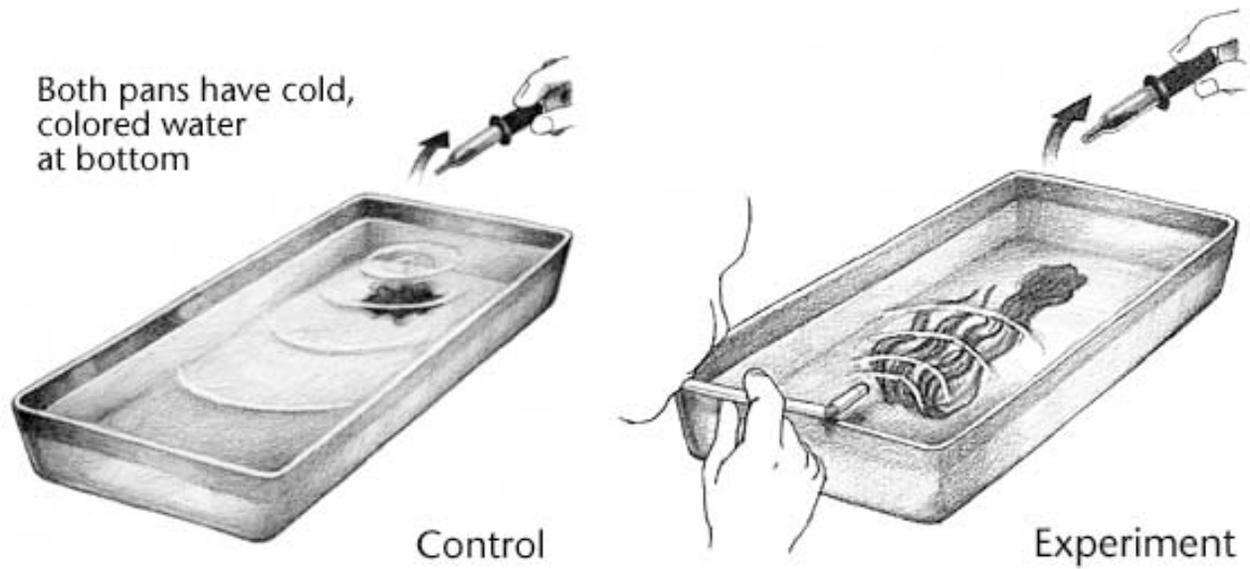
Per group of 2-4 students: 2 transparent pans at least 5" x 9" x 2" deep, food color, ice, water, medicine dropper, water pitcher, small container, flexible plastic drinking straws for each student.

Procedure

(teams, small groups)

- From the pitcher, fill both pans with room-temperature water to about 1/2 inch from the top. One pan will be a control.
- Let the pans sit undisturbed until the water is quiet, about 5 minutes.
- Prepare colored ice water in the small container.
- Slowly release a few drops of cold, colored water at the bottom (near one end) of each pan. This will represent nutrient-rich water. Where is the cold water? Record your observations.
- Rest the straw on the end (opposite the colored water) of one pan. Gently blow across (not into) the water, creating offshore waves.
- Compare the results with the control pan. Record your observations.
- Have one person in each group report the observations. Compare these results.

What happens to the "nutrient-rich" water when the surface water is moved away by the wind?



Local Connection

In recent years, has your local area been affected by an El Niño weather pattern? How?

Key Words

upwelling, nutrients, phytoplankton